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Document:

# User Guide

Title:

# EdgeX User Manual



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# 1. INTRODUCTION

This manual covers information relevant to the EdgeX data acquisition system for both on-line operation and user training.

EdgeX is trademark name for Expro (North Sea) Ltd. providing a real time and multi-tasking environment for retrieval, storage and historic reporting of data.

Expro application programs interfaced with ScadaPro (Orchestrator) acquisition utilities and running under Windows NT/XP operating system provides the basis for the complete EdgeX system.

Documentation includes references, which cover mandatory requirements as covered by the company's policy of quality assurance. Any work instructions (WI) and quality assurance documents (QAD) are adequately identified and where appropriate must be strictly adhered to.

This manual and the software are subject to regular modifications, enhancements and updates.

Some reproduced graphics and/or general material contained herewith may therefore differ slightly from its related software counterparts.

This manual may or may not contain references to additional services offered over the basic EdgeX product

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# 2. GENERAL EQUIPMENT

## 2.1 INTERFACE UNIT

Connect as per 'Typical Interface Hook-up' schematic in Appendix A.

All transducer connections must come through the interface unit which provides a galvanic isolator or Zener Barrier to give the system intrinsically safe circuits in hazardous areas. The interface must be correctly earthed to an I.S. (Intrinsically Safe) earth.

The RS232 input/output from the interface is via the 9 pin 'D' type socket to the computer system.

Input voltage = 240v AC or 110v Ac.

The unit contains:

1 x Datascan 7010 + 1 x Datascan 7020 + 1 x Datascan 7041 (Older models)

Or

1 x Datascan 7220 + 1 x Datascan 7041(Some systems may be housed independently)

And

16 x MTL 788 (Anal) Zener Barriers + 8 x MTL 787 (Digital) Zener Barriers

Or

<=16 x P&F Analogue Galvanic Isolators + <=8 x P&F Pulse Galvanic Isolators.

The switch settings for the Datascan can be found in the 'Switch Settings' in Appendix A section.

Datascan Descriptions (Additional info - refer to DATASCAN 7000 Manual)

**7010 Unit:**

This takes the configuration from the computer and applies conversions to each of the input channels. The 7010 reads all other Datascans on the system. It has a battery-backed memory for system configuration.

**7020 Unit:**

This processor converts up to 16 Analogue signals to Digital signals. This enables the channels to be converted to engineering units by the 7010 unit. Connection is via a 25-way ribbon cable.

**7041 Unit:**

This processor is totally digital inputs for counting the pulses from flow meters. It is connected to the 7010 via a single pair network cable.

Circuits 1 - 8 are high-speed digital counters.

Circuits 9 - 16 are low speed digital counters.

By default only the high-speed counters are wired to the rear panel for standard use.

**7220 Unit:**

This is a combination of the 7010 and 7020 units.

**Additional:**

Multiple Interfaces are connected via RS422 3 pole connectors on rear panel to increase channel measurement capability

E.g. 16 analogue + 8 digital

32 analogues + 16 digital

Etc

(See 'Switch Settings' section or Datascan Manual for address switch settings for multiple units).

## 2.2 COMPUTER PERIPHERALS

PC

Connect as per 'Typical PC Hook-up' schematic in Appendix A.

See separate instruction for typical minimum specification

Wide Printer [optional]

Connect as per 'Typical PC Hook-up' schematic in Appendix A.

An FX1050 type or similar is used for outputting multi channels in real time.

RS 232 Card required.

**Warning.** Never rotate roller feed manually on Epson style printers with the power switched ON to prevent damage to the feed knob, which is under servo control.

Units are designed to feed paper with front panel and/or software controls.

Colour Printer

Connect as per 'Typical PC Hook-up' schematic in Appendix A.

An HP DeskJet 990C or higher resolution colour printer is used for outputting system graphics.

Ethernet Card

Ethernet networking is dedicated to providing additional monitoring terminals

(See 'Networks' section for additional/detailed information).

## 2.3 EXTERNAL SENSORS HOOK-UP SECTION

**Multicore Cable**

When laying out any cable systems, the following practises must be followed:

- ✓ Do cable tie (or alternative type of support) to rig support structures etc.
- ✓ Do ensure that junction boxes etc are mounted above deck level and adequately protected.
- ✓ Do NOT leave cables across walkways without suitable angle iron (or alternative) protection.
- ✓ Do NOT tie cables overhead which may impair rig operations e.g. Crane movements, etc.
- ✓ Do NOT strap cables to potentially hot lines or rig power supply cables.

Cable reel connectors are weatherproof units, however the cable reels DO NOT have a watertight seal, and therefore you must ENSURE cable reels are NOT exposed to water, rain, etc. (Moisture, water, etc can ingress into any connector and will cause terminal corrosion thus causing eventual circuit problems).

**Sensors**

Pressure Units

Pressure units should be connected via a block valve and optional hose.

Temperature Units

Temperature units should be positioned inside thermo wells to give good thermal conductivity and not expose the temperature element to any pressure. Thermo well should be filled with light oil. A quick union adapter is used to enable easy installation/removal between the sensor and the thermo well. In addition, it provides mechanical stability and protection for the PRT.

**There is a direct air path to the sensor electronics. Serious damage could occur to the sensor if the unit is left exposed.**

Differential Units

Differential units should be positioned above the well test “Barton” recorder. The hoses or SS tubing should be connected into the top of the “Barton” bellows unit with an isolating valve.

No low points should be in the hoses or SS lines. I.e. no loops

During cleanups and/or separator stabilization’s it is not uncommon for fluids to carry over into the gas line and hence the sensor control line(s) can become unbalanced. Bleed down sensors at regular intervals to prevent this happening. This may be carried out via the bleed screw ports on the sensor taking extreme care not to damage the fine threads when re-tightening

OR

Isolate the control lines/equalizing manifold, bleed through and re-connect in conjunction with well test supervisor.(NB: Mounting the sensor vertically and in a higher position relative to the Barton Recorder is preferable).

Junction Boxes

Junction Boxes should be mounted in a place where they will encounter minimum effect of adverse weather and mechanical damage. All Junction box protectors should be connected at all times unless they are in use.

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# 3. INITIALISATION & REAL TIME BASICS

## 3.1 INITIALISATION

Verify PC Date/Time

If time requires a backward change during real time logging then problems can/will occur with the log files. In this situation, the user has 2 choices depending on site conditions.

1. Disable system and wait for over an hour, (this will of course lose data during the wait period).

Access and disable EdgeX.

Disable active loggers (set to {**Create**} mode).

Ensure any other "Window" task is closed down.

Double-click on the time control button on the bottom right of the taskbar (Alternatively access date/time via Control Panel)

Edit as appropriate.

Wait over one hour and re-enable EdgeX.

Auto start on loggers should automatically re-enable logger.
Access logger (reset to **Append** Mode)

2. Create new logger to avoid time conflicts with files within same logger (this will take several minutes, requires reboot, and splits up continuity with data files).

See '**Create new logger'** section

In addition, ensure the following in between re-boot.

Ensure any other "Window" task is closed down.

Double-click on the time control button on the bottom right of the taskbar (Alternatively access date/time via Control Panel).
Edit as appropriate.

**NOTE: -** Never go back in time within same logger. Use same consideration for time zone changes.

Create "Emergency Disk Backup"

If user shortcut icon is not available on desktop refer to **'Miscellaneous Troubleshooting for NT'** in EdgeX manual.

Backup [username].ORC file

See separate instruction for backups

EdgeX Configurations

Access EdgeX

Edit /modify the following as appropriate.

| | |
|---|---|
| Units | Select **Processors \| Configure Units**<br>Modify or create as appropriate. |

**NOTE: - DO NOT** change units during an active log period. Users must identify and set correct units prior to starting test.

| | |
|---|---|
| Datascans | Select **Devices \| Datascans**<br>Set-up standard pressure, temperature, etc |
| 3rd Party I/P | Select **Devices \| [ASCII?]**<br>Select appropriate ASCII device<br>Set-up auxiliary inputs<br>E.g. SRO, Sand Monitors, etc. |
| RT/Historic | Select **Processors \| Real Time Chans**<br>Edit/re-name real time etc, channels as required.<br>This option may require considerable thought and planning |
| Manual Input | Select **Processors \| Manual Input Channels**<br>Edit/re-name etc. channels as required.<br>If manual input page(s) require editing, refer to EdgeX manual |
| Alarms | Select **Monitors \| Alarm Monitors**<br>Set-up as required. In addition, each channel, per processor/device will require parameters set-up. |
| Loggers | Select **Loggers**<br>Refer to “Loggers Section” |
| Configurable Trends | Select **Replays \| Trends**<br>Create additional client monitors as required. |
| Configurable Monitors | Select **Monitors \| Configurable Monitor**<br>Create additional client trends as required. |
| Real time reports | Select **Processors \| Real Time Reports**<br>Create additional client RT reports as required. |
| Historic Reports | Select User Icon<br>Create additional client historic reports as required. |

There are 3 types of save options to consider for backing up system settings & configurations.

- Local Configuration
- Master Configuration
- Manual User

**Where:-**

**Local Configurations**

System automatically requests users to save changes on selected environments after any modifications have been executed. Local saves imply changes will take effect on any system re-start.

**Master Configuration**

On exiting EdgeX, the user is prompted to save **[username]. ORC** if the system detects that the user has modified any local environments.

**NOTE: -** (User defined Trends, Monitors and Reports are not configurations included within this file and should be saved independently).

**Manual User**

All other user backups achieved by EdgeX utilities or standard Windows explorer function.

**Important: -** Database (Loggers) is completely separate issue - See attached table.

The following table summarizes the 3 group options per configuration.

| | Local | Master | Manual |
|---|---|---|---|
| | Prompted by system | | User |
| 1. Devices and processors | ☑ | ☑ | n/a |
| 2. Loggers<br>"Logger" here implies configuration set-ups only. The actual log files (data) are separate issues | ☑ | ☑ | n/a |
| 3. Configurable Trends | ☑ | n/a | ☑ |
| 4. Configurable Monitors | ☑ | n/a | ☑ |
| 5. Real Time Reports | ☑ | n/a | ☑ |
| 6. Historic Reports | ☑ | n/a | ☑ |

Actual user DATA files are not listed.

All data files reside under the **\EdgeX\Logged_data** folder. A sub – folder is generated for each test using the same name as the user created under logger configuration.

Users must use any EdgeX utility or standard 'Explorer' functions to copy (Backup) all data files to appropriate media (e.g. ZIP, CDR, etc).

### 3.2 REAL TIME MONITORING SECTION

- ✓ Monitor Real Time Clock
- ✓ If start of new test or flow period – See “Loggers Section”
- ✓ Ensure EdgeX is enabled & set to “Auto start” mode.
- ✓ Ensure Logging is enabled.
- ✓ [Recommendation: Use fast logger for typical Wellhead/SRO monitoring]
- ✓ Monitor Logging Rate
- ✓ {Reminder: Trend updates is log rate dependent}
- ✓ Monitor raw meter counts on regular basis and verify with manual system.
- ✓ (Recommend every 6-hour)
- ✓ (All mechanical counter readings should be recorded at the start and end of flow periods).

## 3.3 NEW TEST WIZARD

**Warning!**

Using this application requires a system restart so should only be used when no other applications are running and *all* settings are saved.

The program **NewTestWizard.exe** leads the user through the five steps to start a new test. The wizard has five screens, corresponding to each of these five steps, with Next and Back buttons to navigate between the screens.

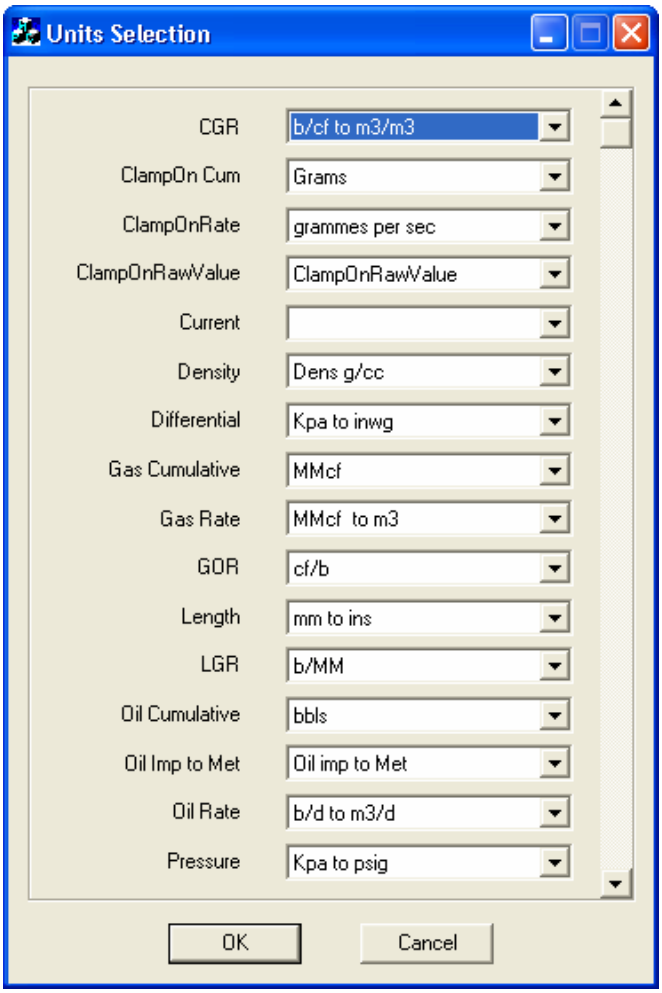
1. The first step is to confirm the Windows Time/Date settings. This is done using the common windows System Time screen.

   Click **'Next'** to continue.

2 The second step is confirming the units to be used. The unit's selection screen is shown to the right.

Unless this is a set-up specific to a particular installation or have been instructed otherwise it is *Highly Recommended* to **accept all defaults.**

Click **'OK'** to accept these settings and **'Next'** to continue.




3. The next step is to give the test an appropriate name. It is recommended to name the test with the **Start Date**, e.g. **010604**. Please avoid the use of special characters as some of these are not supported by the logging software. Click **'Next'** to continue.

4. The EdgeX main screen loads giving the user the opportunity to save the current configuration. Save this as necessary and finally click **'Next'** on the Wizard to continue.

5 This is the final step required to start a new test. To complete the procedure click **'Finish'**.

When **'Finish'** is clicked, the system will shutdown and restart. Other applications that are running may give the user the opportunity to save any unsaved changes. They will do this if they offer this facility when they are terminated or shutdown in any other way. Note that it is a standard operating system feature to allow the shutdown to be cancelled if an application offers the option to save changes made.

**It is recommended to log into the PC with the same user name that was used to initiate 'Reset Test' this is because the system remembers settings on the users profile.**

## 3.4 LIVE TEST MONITORING SECTION

Typical recommendations

- ✓ Monitor Real Time Clock
- ✓ If start of new test or flow period – See "Loggers Section"
- ✓ Ensure EdgeX is enabled & set to "Auto start" mode.
- ✓ Ensure Logging is enabled.
  [Recommendation: Use fast logger for typical Wellhead/SRO monitoring]
- ✓ Monitor Logging Rate
  {Reminder: Trend updates is log rate dependent}
- ✓ Monitor raw meter counts on regular basis and verify with manual system.
  (Recommend every 6-hour)
  (All mechanical counter readings should be recorded at the start and end of flow periods).

## 3.5 COMMON LOGGER CONTROL UTILITY

The Common Logger Control allows users to control loggers without having to enter the Main Menu of EdgeX making it suitable to be used where restricted access to EdgeX is given.

See 'Logger Configuration' section for advanced use

Features of The Common Log Control are:

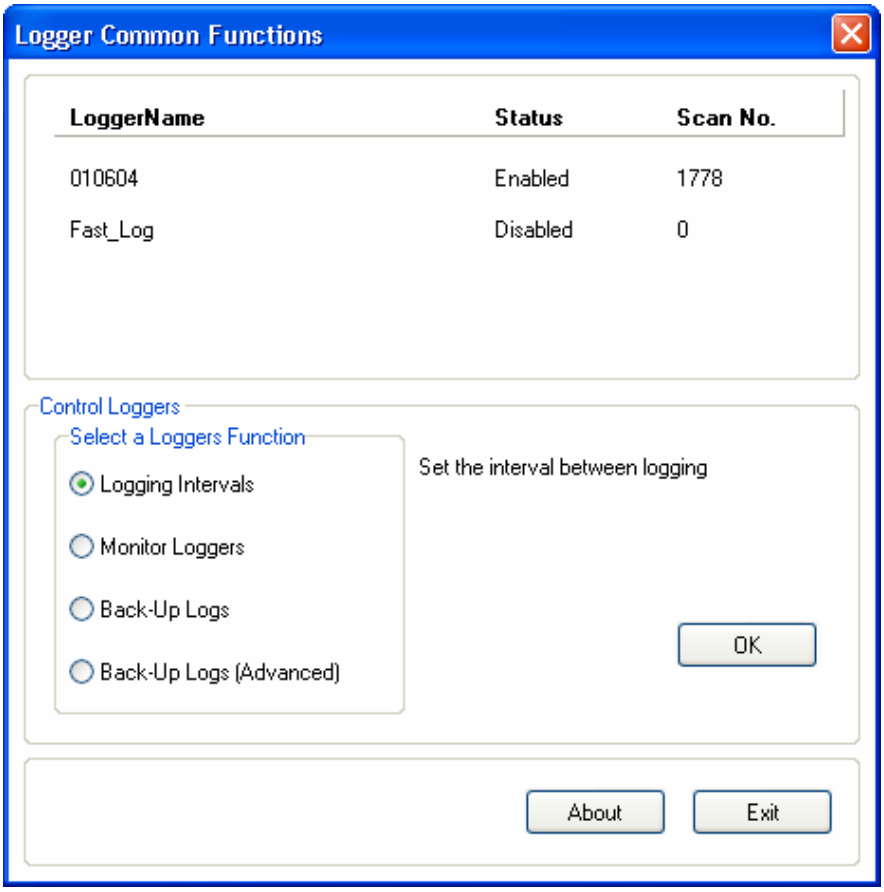
- Enable/ Disable a created log
- Set Logger intervals
- Control the Log File Notifier
- Back up Logs

**Enabling and Disabling a Logger**

1. To Enable/ Disable a Logger move the mouse over the corresponding 'Status' of the log you wish to control. The text shall change to blue and the mouse pointer will change to a hand.
2. Double Click with the left mouse button to change the loggers status
3. The Logger status toggles between Enabled and Disabled.

**NB A prompt is shown to confirm that you want to disable a log.**

To perform any of the other functions click the corresponding radio button and then **'OK'.**



# 4. GENERAL SYSTEM GUIDE

**Program Groups / Icons / User Information**

**It is assumed that users have a basic knowledge of Windows systems and ScadaPro Logging. Although the system by default automatically starts up and commences logging, most tasks are set-up under manual user control. See 'Initialisation and Start up' section for summarised sequences.**

***Hint!*** To switch between active tasks press 'ALT + TAB' key sequence.

Unnecessary active tasks, as well as inconvenience, will utilise system resources and memory and cause system degradation or at worst a system failure.

Operating system should **always** be terminated naturally as and when required by executing CTRL + ALT + DEL (soft boot) key sequence to enable shutdown option, and never deliberately switched off by main power switch.

For simplicity and ease of use, the most common Orchestrator functions and Expro's personalised icons and are grouped together under one common group.
Users can re-arrange, add, etc as required.

Individual ScadaPro icon functions are fully described within the on-line help system and the Orchestrator real time manuals.

**The following pages provide typical information on Manual Input displays and real time use.**

**Some systems may have certain items omitted or added dependant on time of issue.**

## 4.1 MANUAL INPUTS

Concept

Calculations invoked within the system (e.g. Oil, Gas, Sand, etc.) are dependent on continually changing variables, which may be available in either real or historic time or both. The Manual Input (MI) file provides the interface for the calculation system. Various MI pages are used for user input. When data is entered, the system will assume the data values for current data onwards, and will also re-calculate historic data from the time stamp.

The primary role of Manual Inputs is as explained above. However systems can be modified for new third party data in situations that automatic recovery of data (Datascans, RS232) cannot be achieved. See 'System Configuration - Manual Inputs' section for information on new channel creations.

**Reminder**

Any MI logged to disc with main logger can be trended, reported, etc.

Although EdgeX is capable of logging data into multiple loggers, ONLY the top-level logger is capable of historic and real time re-calculation.

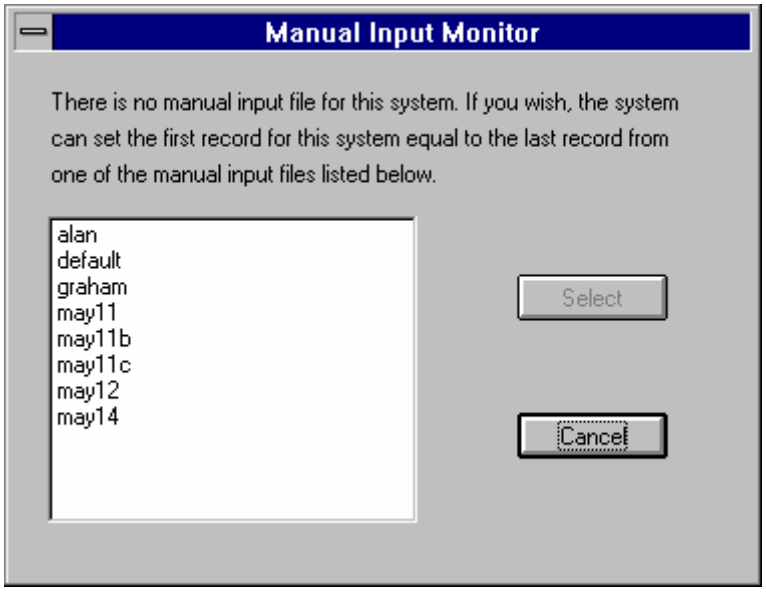
**EXPRO CALCULATED DATA IS SAVED UNDER THE RH CHANNELS PROCESSOR.**

**THIS IS THE ONLY PROCESSOR THAT ANY DATA LOGGED TO DISK CAN BE RE-CALCULATED/MODIFIED.**

Manual input file is logger dependent and will assume logger name.

Changing Manual Input Values

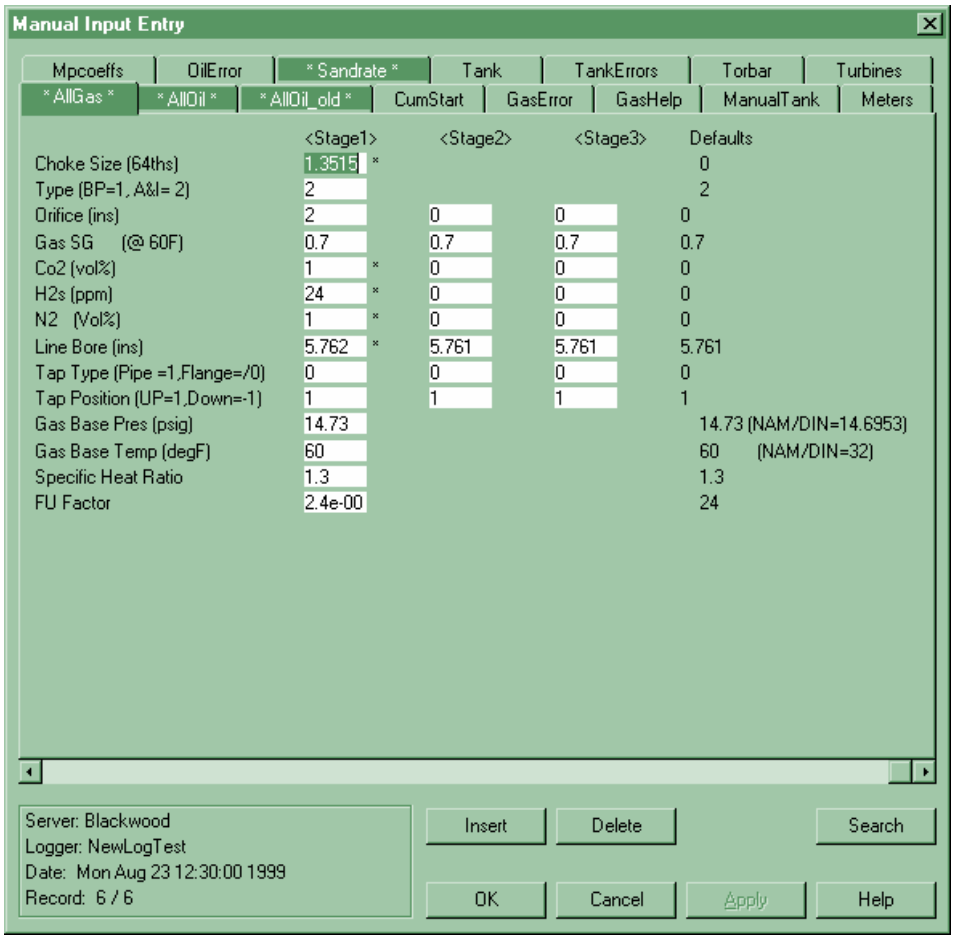
When the manual inputs options is selected, the system checks to see if a manual input file for the current system exists. The manual input file name is derived from the name of Orchestrator logger 1. If no manual input file exists, the following menu is displayed:




The box displays a list of all the loggers for which manual inputs files do exist. Clicking on one of these and then pressing the *Select* button uses the most recent record in the selected file as the first record of a new manual input file. Selecting *Cancel* will create a new manual input file that has no records in it.

If a manual input file does exist, this dialog is not displayed.

A dialog showing the manual input pages is then displayed, as illustrated below:




This is a multiple page dialog box, with each page containing a combination of plain text and manual input values. The pages are arranged in alphabetical order, and a different page can be selected by clicking on the title, or *tab* of the page.

The date and time of the displayed manual input record are displayed near the bottom right of the screen. This also shows:

- the server from which the manual input values are being retrieved
- the name of the logger on that server
- how many manual input records exist for this logger
- the index of the manual input record displayed

The server from which the manual input values are retrieved is the server specified on the channel list configuration screen, or the realtime report configuration or the log file-exporting program.

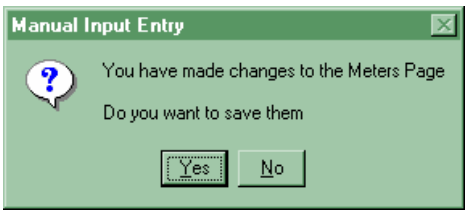
The manual input values are shown in the middle of the screen. An asterisk (*) to the right of a manual input value indicates that the value was changed from the previous record. This information is used in cumulative calculations to reset the total to a specific value at the manual input record time. An exclamation mark (!) to the right of a field indicates a changed field that has not yet been saved.

The scrollbar along the bottom of the screen is used to change the manual input record displayed. The position of the box in the scrollbar indicates the relative time of the manual input record displayed - the further left the box, the earlier the manual input record that is being displayed. The scrollbar can be moved in any of the standard Windows ways:

- clicking on the arrows at the left or right hand side of the scrollbar
- clicking on the scrollbar to the left or right of the scrollbar box
- dragging the scrollbar box to the desired position

Clicking on the *Search* button provides an alternative way to change the manual input record that is displayed. A menu prompting for the date and time of interest appears. When values for these have been entered, the manual input record that applies at this date and time is displayed. This will be the record at the desired time; or the record preceding the desired time; or the first record in the manual input file, if the desired time is earlier than the first record.

To change the manual input values at the displayed time, enter new values into the corresponding fields. As soon as a value is entered, an exclamation mark will be placed alongside the number to indicate that it has been changed. The manual input record is not stored until the scrollbar is moved, or until one of the buttons is selected. Clicking either the *OK* or the *Apply* button saves the changes without asking for confirmation. Under any other circumstances, the user will be asked if changes are to saved or not:




This prompt is repeated for each page on which changes have been made. The user can select a different response to each of these prompts, i.e. if there are changes on four pages, the changes on two pages can be saved, and discarded on the other two pages.

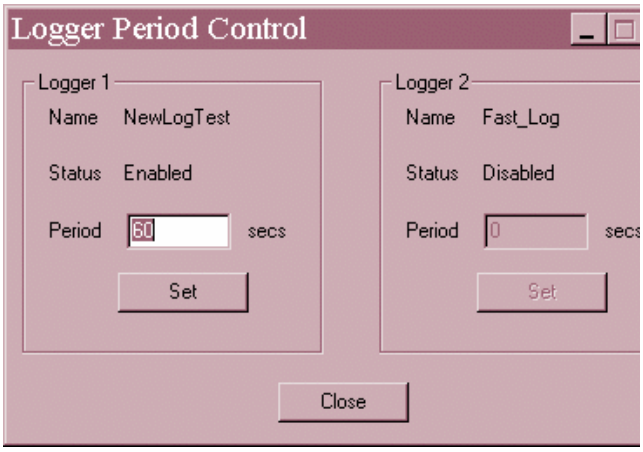
To insert a new manual input record, click the *Insert* button. A menu prompting for the date and time of the record to be inserted appears, defaulting to the date and time of the displayed manual input record. A new record is created that is initially identical to the record at the preceding time. Note that this is not necessarily the record that is displayed when the *Insert* button is clicked. To change the values in this record, enter values as described in the previous paragraph. A manual input record for a time in the future may be entered. When this time arrives, the system will automatically load this record and use it in all the calculations.

Clicking on the *Delete* button removes the displayed manual input record. The user is prompted to confirm this option.

Changing manual input values sets the recalculation status to *Pending*. If the recalculation status is *Automatic*, the pending recalculations are performed when the manual input entry program is terminated (*OK* or *Cancel* clicked).

## 4.2 LOGGING RATE

A menu is available to dynamically change the rate at which Orchestrator logger 1(Top level logger) & logger 2 logs. When the rate is changed, the logger is set-up so that it logs on even time boundaries.




For Logger 1 (defaults to 1 minute on system restarts, assuming 'Auto start' is enabled)

- 15 minutes recommended for stable production environments.
- 5 minutes recommended for stable to known changing environments.
- 1 minute recommended for continually changing environments (e.g. Initial 'Well Open' etc).

**Recommendation:**

**DO NOT** leave on <= 1 minute rate for any substantial time period!!

**Reminder:**

The logging rate determines how much data is saved on the hard disc. Experience dictates that masses of data stored is unmanageable, of no additional value and time wasting for users **BOTH** during real time collation and historical reporting.

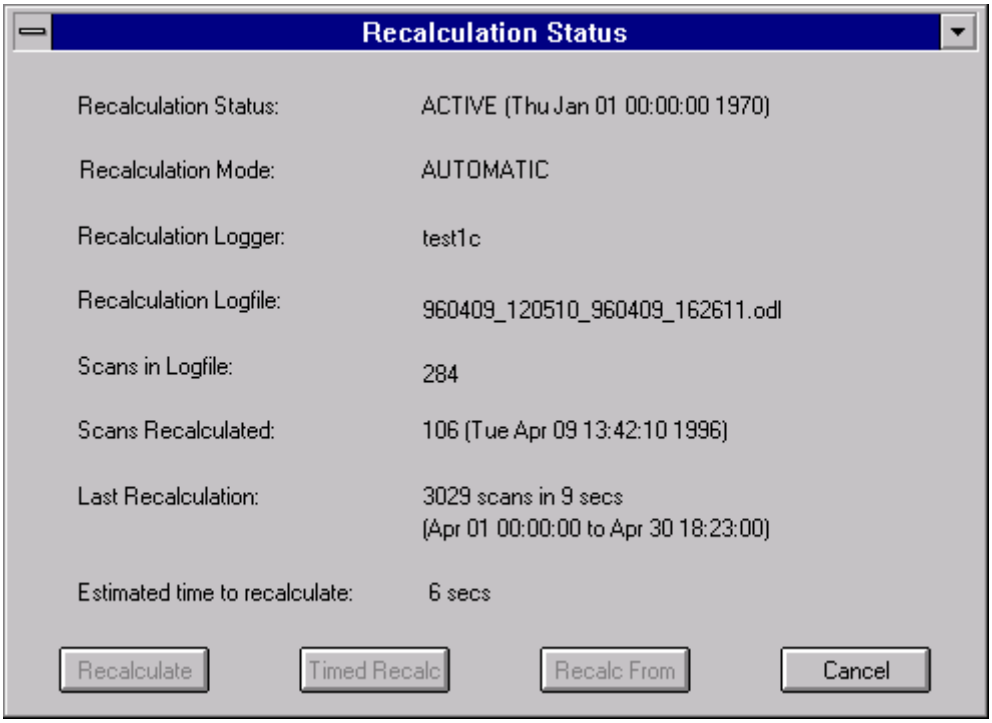
For Logger 2 (defaults to 1 sec on system restarts, assuming 'Auto start' is enabled)

Typically, this logger is set for choke and annulus or SRO channels**.**

**This can be set for faster scanning independently from Logger 1.**

## 4.3 RECALCULATION STATUS

The Recalculation Status Menu displays the current recalculation status of the system and, if recalculations are pending, lets the user initiate a recalculation, as illustrated below:




All recalculations done by the system are timed, and the results displayed on the menu. If there is a pending recalculation, an estimate of how long the recalculation will take is displayed. During a recalculation, this estimate is updated. The estimate is calculated pro-rata on the time taken for the last recalculation - for instance if the last recalculation covered a period of 6 hours and took 10 seconds, then the system will estimate that a recalculation of 24 hours will take 40 seconds. This estimate will only be accurate if the logging rate for the last recalculation done and the pending recalculation are the same.

The fields ***Recalculation Logfile***, ***Scans in Logfile*** and ***Scans Recalculated*** are only present while a recalculation is active, and indicates the progress of the recalculation.

The ***Timed Recalc*** button initiates a recalculation starting one hour ago, and can be used to obtain an estimate of how long a recalculation is likely to take, if no recalculation has been done on the system since it was last restarted.

The ***Recalc*** *From* button prompts for a date and time, and initiates a recalculation from the specified time.

Recalculations need only be initiated from this menu if the recalculation mode is Manual; if the recalculation mode is Automatic, recalculations are done automatically when the reference the manual inputs are updated.

***Important Note!***

Flowrates generated in real time can differ (often fractionally) from Flowrates re-generated historically.

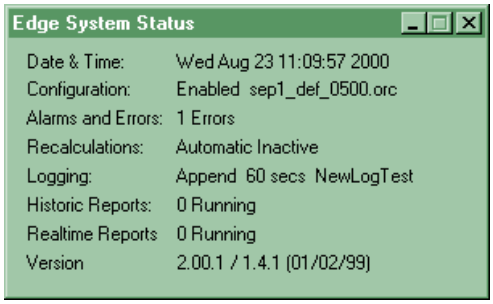
This is primarily caused by the system generating Flowrates from fast (1 second) calculations in real time, but can only use the data in the Logfile (controlled by log rate) for historical recrunch.

By default users correct final report data by activating the recalculation status when entering/updating manual inputs. This is not however fail-safe and in particular when some long tests may avoid daily manual inputs.

Users **MUST** invoke 12/24 hour activation's to force the system to recalculate (adjust) Flowrates prior to reporting final data.

## 4.4 STATUS DISPLAY

The system status display is a small window similar to that shown below, that displays the current status of the system



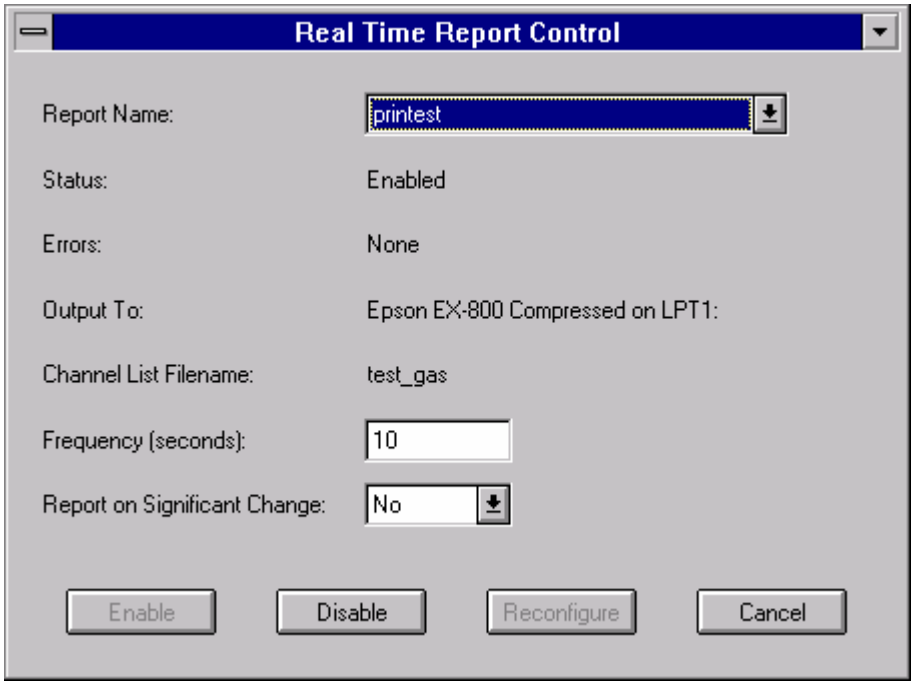

This menu displays the following information:

- the current date and time
- Orchestrator status (Enabled in the above menu)
- Orchestrator configuration name (sep1_def_0500.orc in the above menu)
- the number of Orchestrator alarms and errors, if there are any alarms, the number of unacknowledged alarms is also shown
- recalculation mode (Automatic or Manual) and status (Inactive, Pending or Active)
- Current mode of Orchestrator logger number 1 (i.e. Create or Append)
- Current logging period of Orchestrator logger number 1. If the logger is not enabled, *Disabled* is displayed instead of the logging period
- the name of the logger (NewLogTest in the above menu)
- the number of historic reports currently running
- the number of real-time reports currently running
- the version details of the EdgeX supplementary software (2.00.1) and the EdgeX configuration (1.4.1 (01/02/99))

Clicking on the system menu box displays a menu that has an entry *Always On Top*. If this option is checked (has a tick mark beside it), the menu will stay on top of all other menus. Selecting the option from the menu toggles the checked status alternately on and off.

## 4.5 REAL TIME REPORT - START/STOP

The menu displayed when a serial report is monitored is:



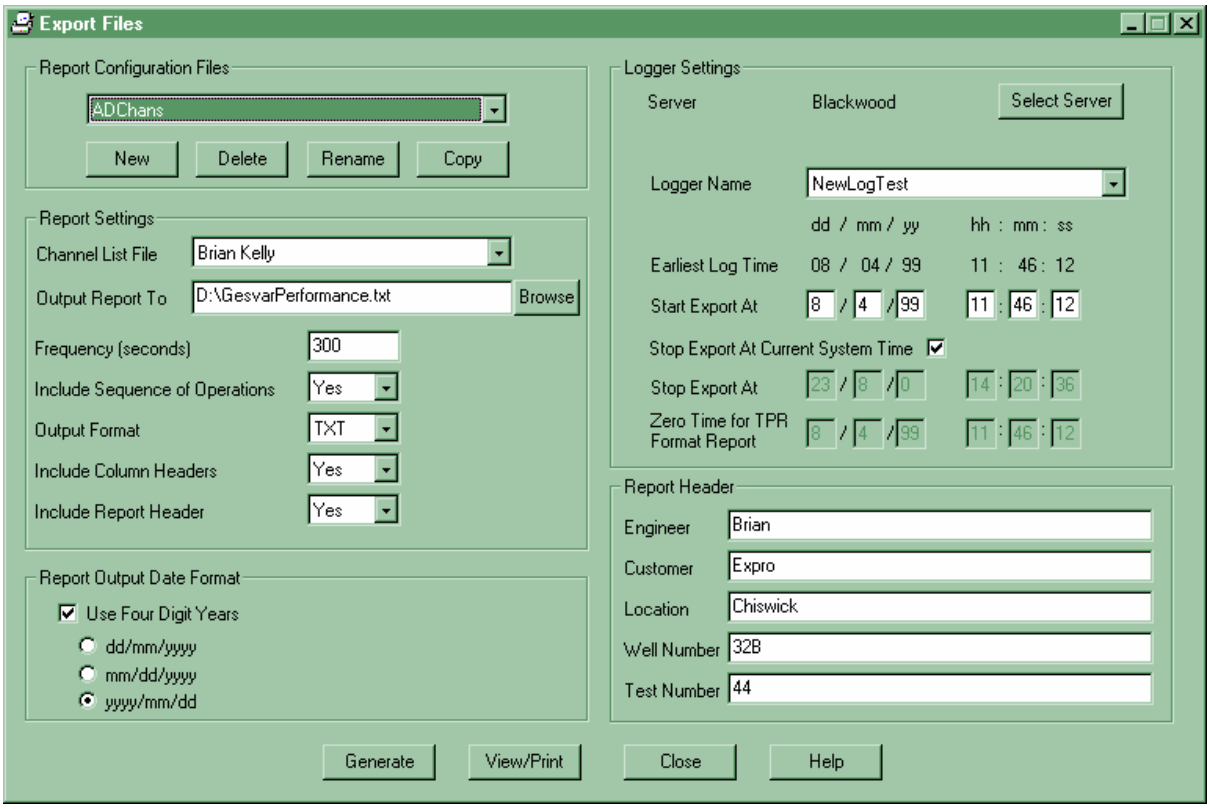

The ***Report Name*** box lets any of the configured serial reports be selected. If the report status is ***Enabled*****,** the frequency at which lines of the report are generated and whether or not a line is generated if any of the reporting channels have their significant change flag set can be changed. After changing one of these fields, click on the ***Reconfigure*** button to instruct the serial report to use the changed values. Any changes in these fields made using this menu are temporary, and apply only to the current incarnation of the report. If the report is stopped and then restarted, it will use the values in the report configuration.

The report can be stopped by clicking the ***Disable*** button. Clicking on the ***Enable*** button will start a report.

If the checkbox ***Enable Real Time Reports*** described Real Time Configuration section is not checked, then reports cannot be started. The status field will display ***Report Server Disabled*** **if** real time reports cannot be started.

## 4.6 HISTORIC REPORT - START/STOP

When the Export Files program is started, a list of all the configured Logfile reports on the system is displayed.




The system maintains separate, named, report configurations. The configuration that was previously selected is reloaded when the program is first started. The combo box at the top left of the dialog can be used to select any other configuration that has been created. Just beneath this combo box are buttons to create a new report configuration from scratch (the *New* button), to *Delete* or *Rename* the displayed configuration, and to *Copy* the displayed configuration.

The report configuration maintains only the values in the *Report Settings* area of the dialog. When a different report configuration is selected, only the values in this area of the dialog change.

The fields in the *Report Output Date Format* are global, and are shared between all reports. The *Server* is also a global setting. The other fields in the *Logger Settings* area and all the fields in the *Report Header* are associated with the selected logger, not the selected report. When the selected logger is changed, the values in these fields change.

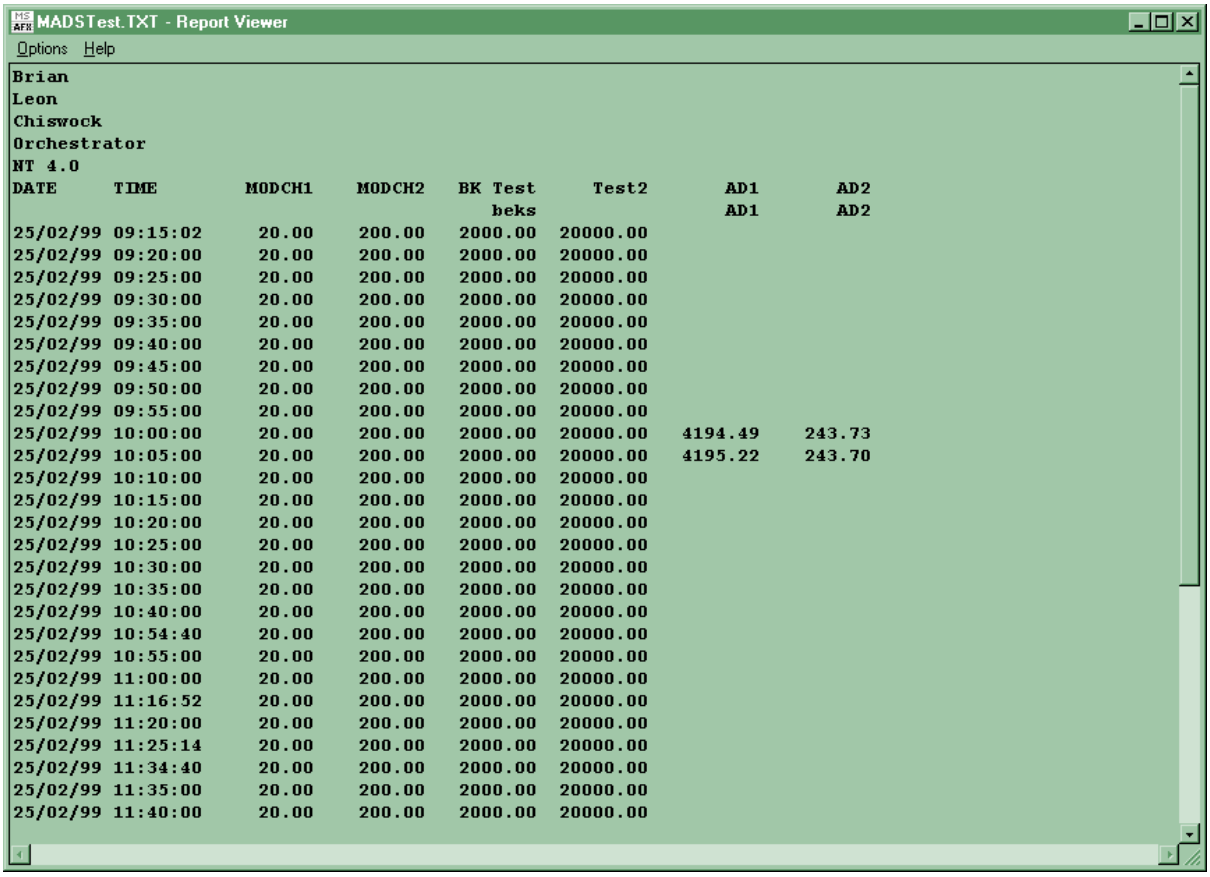
The fields on the dialog are described in more detail below:

| | |
|---|---|
| Channel List File | Allows any of the configured channel lists to be selected, to define the channels to be reported |
| Output Report To | Specifies the file to which the report will be written. This can be changed by clicking on the *Browse* button next to the field |
| Frequency | Specifies the interval between report lines, in seconds. If this is less than the rate at which data was logged, not all logs in the log files will be reported |
| Include Sequence of Operations | Specifies whether or not sequence of operations entries will be incorporated into the report |
| Output Format | Toggles between TXT, PRN, TAB, CSV and TPR |
| Include Column Header | Specifies whether or not column headers are to be included in the report. If the selected report format is TPR, no headers are included in the report and this field is greyed out |
| Include Report Header | Specifies whether or not the report header is to be included in the report. If *Include Column Header* is selected as *No*, no report headers will be included in the report, and this field is greyed out. The field is also greyed out if a TPR is being generated. |
| Use Four Digit Years | Specifies whether to use two or four digit years in the report |
| dd/mm/yyyy<br>mm/dd/yyyy<br>yyyy/mm/dd | Allows the date format to be selected, there are three options plus the option to have wither two digit or four digit years. The text of the options change depending on whether two digit or four digit years are selected<br><br>Note that all fields relating to date format are greyed out if a TPR report format is selected, this format uses time in decimal hours from a user-specified zero time |
| Logger Name | Specifies the logger on which the report is to be generated |
| Earliest Log Time | Displays the date and time of the earliest log for the selected logger, this is for information only and cannot be displayed |
| Start Export At | Specifies the time at which the report should start. |
| Stop Export At Current System Time | If this is ticked, then the *Stop Export At* fields are greyed out, and the report will automatically terminate when it reaches the system date and time |
| Stop Export At | Specifies the time at which the report should stop |
| Zero Time for TPR Format Report | This field is only available if the report format is TPR, and specifies the zero time for the report |

All reports are generated to a disk file. Clicking the *Browse button* calls up a standard Windows File Save As type dialog to let the filename be selected. The file can be placed on any drive that can be seen by the system, including floppy disks and network drives. If a file that already exists is selected, the system asks for confirmation that the file is to be replaced.

Clicking on the *Generate Report* button generates the report, writing it to the specified file. The report will access as many log files as are required to generate the report, between the specified start and stop times. If the sequence of operations has been included in the report, the system will report if there was some problem accessing the diary. For instance, if it has entries that are not in chronological order, or if it has entries that are not recognised by the system.

After a report has been generated, it can be viewed on screen and/or printed. Clicking the *View/Print Report* button calls up the report viewer program, as illustrated below:




Brian
Leon
Chiswock
Orchestrator
NT 4.0

| DATE | TIME | MODCH1 | MODCH2 | BK Test beks | Test2 | AD1 AD1 | AD2 AD2 |
|---|---|---|---|---|---|---|---|
| 25/02/99 | 09:15:02 | 20.00 | 200.00 | 2000.00 | 20000.00 | | |
| 25/02/99 | 09:20:00 | 20.00 | 200.00 | 2000.00 | 20000.00 | | |
| 25/02/99 | 09:25:00 | 20.00 | 200.00 | 2000.00 | 20000.00 | | |
| 25/02/99 | 09:30:00 | 20.00 | 200.00 | 2000.00 | 20000.00 | | |
| 25/02/99 | 09:35:00 | 20.00 | 200.00 | 2000.00 | 20000.00 | | |
| 25/02/99 | 09:40:00 | 20.00 | 200.00 | 2000.00 | 20000.00 | | |
| 25/02/99 | 09:45:00 | 20.00 | 200.00 | 2000.00 | 20000.00 | | |
| 25/02/99 | 09:50:00 | 20.00 | 200.00 | 2000.00 | 20000.00 | | |
| 25/02/99 | 09:55:00 | 20.00 | 200.00 | 2000.00 | 20000.00 | | |
| 25/02/99 | 10:00:00 | 20.00 | 200.00 | 2000.00 | 20000.00 | 4194.49 | 243.73 |
| 25/02/99 | 10:05:00 | 20.00 | 200.00 | 2000.00 | 20000.00 | 4195.22 | 243.70 |
| 25/02/99 | 10:10:00 | 20.00 | 200.00 | 2000.00 | 20000.00 | | |
| 25/02/99 | 10:15:00 | 20.00 | 200.00 | 2000.00 | 20000.00 | | |
| 25/02/99 | 10:20:00 | 20.00 | 200.00 | 2000.00 | 20000.00 | | |
| 25/02/99 | 10:25:00 | 20.00 | 200.00 | 2000.00 | 20000.00 | | |
| 25/02/99 | 10:30:00 | 20.00 | 200.00 | 2000.00 | 20000.00 | | |
| 25/02/99 | 10:35:00 | 20.00 | 200.00 | 2000.00 | 20000.00 | | |
| 25/02/99 | 10:40:00 | 20.00 | 200.00 | 2000.00 | 20000.00 | | |
| 25/02/99 | 10:54:40 | 20.00 | 200.00 | 2000.00 | 20000.00 | | |
| 25/02/99 | 10:55:00 | 20.00 | 200.00 | 2000.00 | 20000.00 | | |
| 25/02/99 | 11:00:00 | 20.00 | 200.00 | 2000.00 | 20000.00 | | |
| 25/02/99 | 11:16:52 | 20.00 | 200.00 | 2000.00 | 20000.00 | | |
| 25/02/99 | 11:20:00 | 20.00 | 200.00 | 2000.00 | 20000.00 | | |
| 25/02/99 | 11:25:14 | 20.00 | 200.00 | 2000.00 | 20000.00 | | |
| 25/02/99 | 11:34:40 | 20.00 | 200.00 | 2000.00 | 20000.00 | | |
| 25/02/99 | 11:35:00 | 20.00 | 200.00 | 2000.00 | 20000.00 | | |
| 25/02/99 | 11:40:00 | 20.00 | 200.00 | 2000.00 | 20000.00 | | |

The scrollbars can be used to scroll the view of the report to display parts of the report that cannot be seen.

The *Options* menu allows the font in which the report is displayed and printed to be changed, and lets the report be printed or print previewed. Standard Windows dialog boxes are used to prompt for the font to be used, and for printing, apart from a dialog box that prompts the user to specify

- the page number that will be put on the first page of the printout
- the left margin to be used on the printout

It is recommended that the report be viewed and printed using a fixed pitch font (Courier New was used for the report illustrated above). If a fixed pitch font is not used then the columns headers may not align properly with the report values.

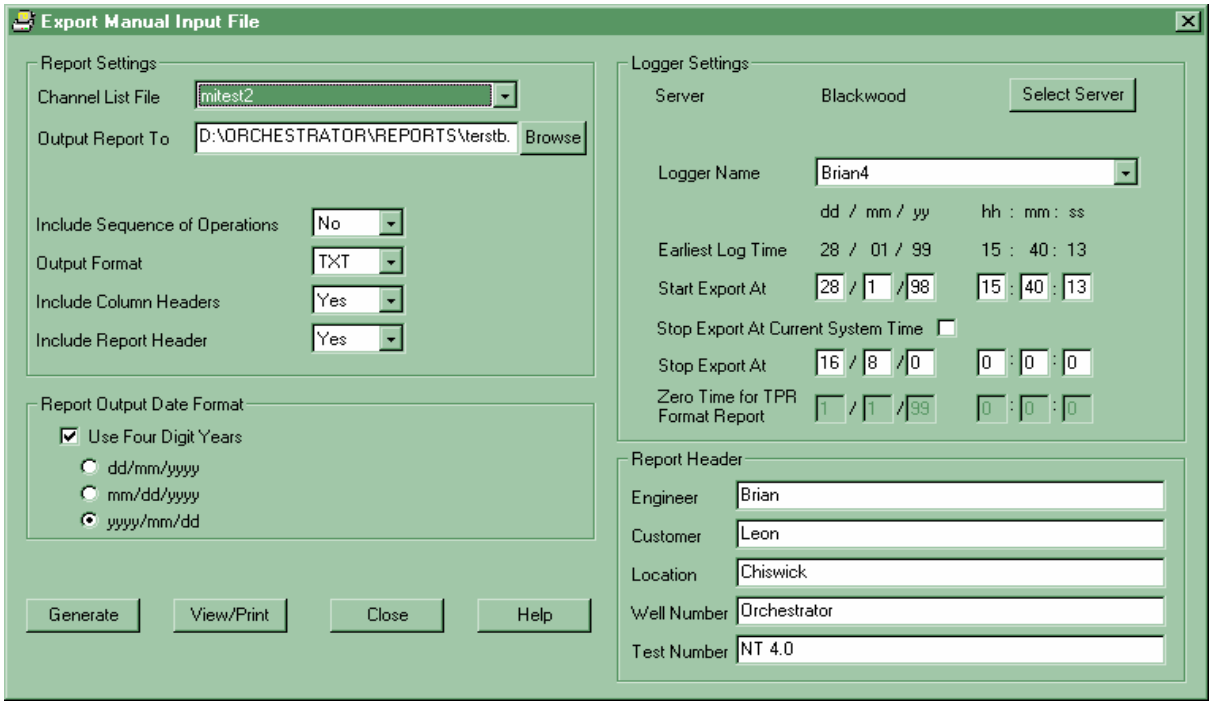
If a report was generated with either the report header or column headers, then these will be printed at the top of each page.

## 4.7 MI HISTORIC REPORT

Manual input reporting is similar to historic reporting, described above. The differences are as follows:

- There are no named manual input report configurations; there is only a single report configuration
- The report is generated from the manual input file, not from log files. Therefore, only manual input channels can be reported
- There is no report frequency option; all the records in the manual input file between the specified start and stop times are reported

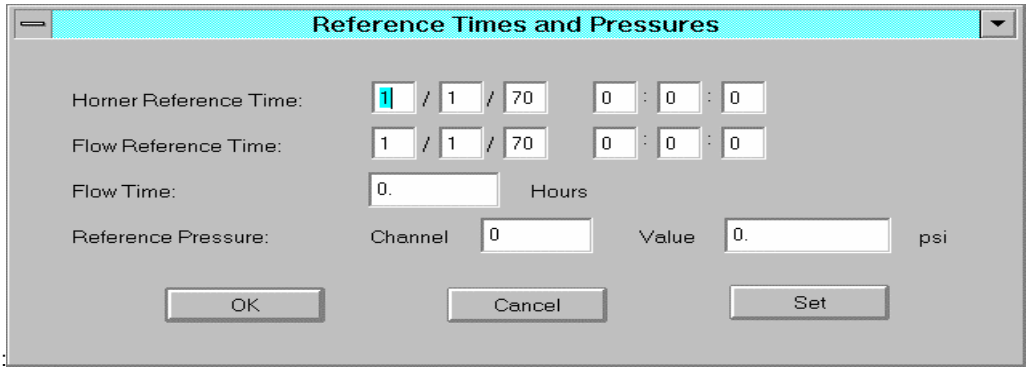
When the manual input reporting program is started, the following menu is displayed




Apart from the absence of the *Frequency* fields, this menu operates in the same way as the Logfile reporting menu.

**Reference Times** (Optional utility)

Reference times are used by the Analysis calculations performed by the Real Time / Historic Calculator described in 'Real Time / Historic Calculations Configure' section. The menu used to change reference times is illustrated below.




The ***Set*** button takes the current value for the reference pressure channel and uses that as the reference pressure.

Changes to the information on this menu are saved by clicking on the ***OK*** button, or discarded by clicking on the ***Cancel*** button. If the changes are saved, then the recalculation status of the system is set to pending, and a recalculation automatically initiated if the recalculation mode is Automatic.

## 4.8 SEQUENCE OF OPERATIONS

The sequence of operations is a plain text file that can be maintained by the user with a standard editor such as Notepad. The system creates the sequence of operations for the system in the ***\Logged data\Logger Name*** directory.. For instance, if the name of logger 1 is NINIAN, the sequence of operations should be in ninian_diary.txt.

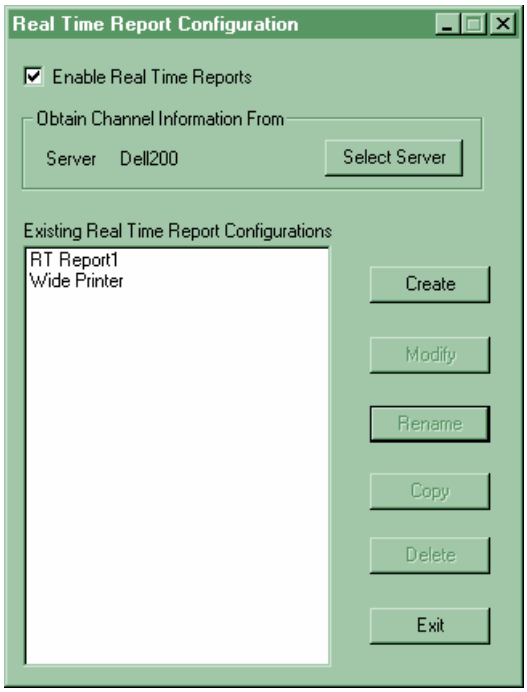
The entries in the sequence of operations are expected to be in chronological order (earliest first), with each line date and time stamped with a data and time in either dd/mm/yy, hh: mm: ss or hh: mm: ss dd/mm/yy format.

If the sequence of operations is included in a Logfile report or a manual input report, the system reports if it detects any unrecognised or out-of-order entries.

A sequence of operations editor (DIARYPAD.EXE) is provided, that automatically loads and displays the sequence of operations file for the current logger; it not sequence of operations for the current logger exists, it is created, and an entry added for the current date and time indicating when the file was created. This entry can be deleted if desired. Iit is present only to indicate the format of entries required.

## 4.9 REAL TIME REPORT SET-UP

Access to real time report configuration is via the Orchestrator PROCESSORS menu. When the real time reporting processor is selected, a menu displaying the list of configured real time reports is displayed

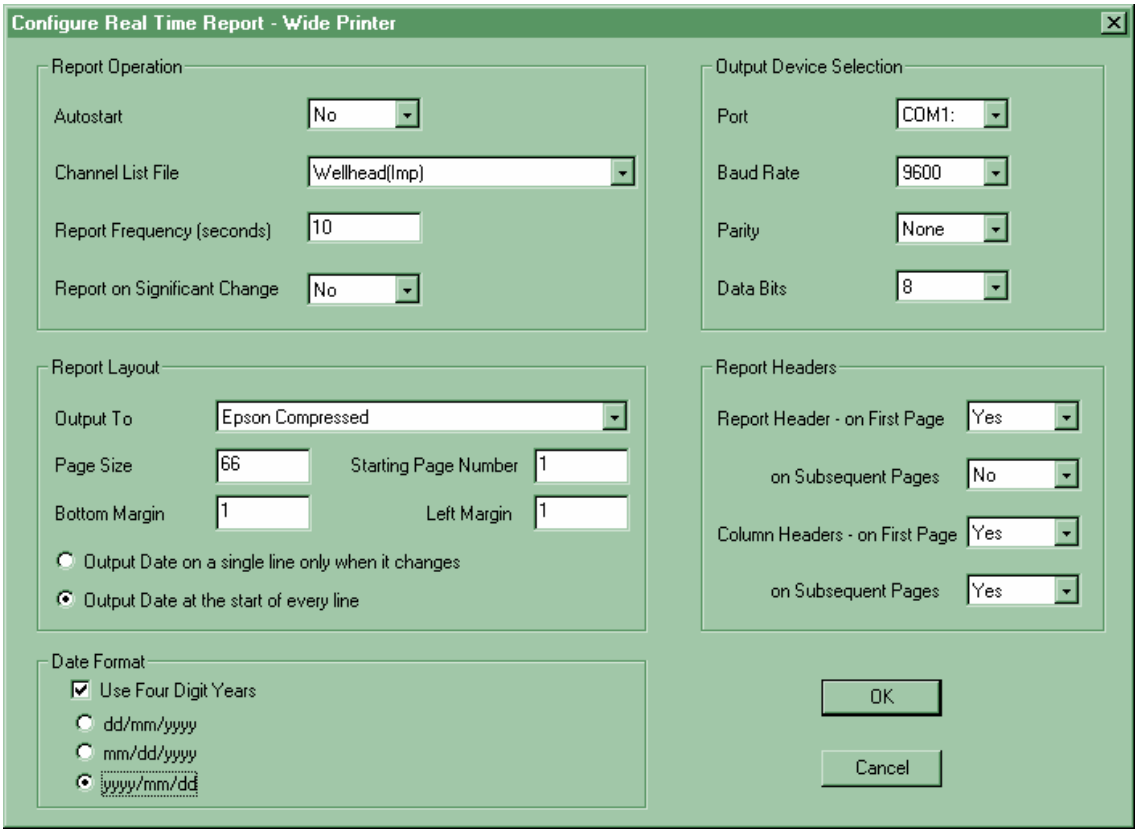



The box *Enable Real Time Reports* must be checked to allow real time reports to be run. This box must be checked even if reports are started and stopped manually.

Real-time reports can be run on client PCs, which access a remote Orchestrator server to retrieve channel values. The *Select Server* button allows selection of the server to be used.

Buttons are available to *Create* a new report configuration from scratch, to *Modify* an existing configuration, to *Rename* an existing configuration, to create a new configuration by *Copy*ing an existing configuration, or to *Delete* an existing configuration. The *Modify*, *Rename*, *Copy* and *Delete* buttons are enabled on when an existing configuration has been selected by clicking on the desired configuration. Double clicking on a configuration has the same effect as selecting it and then clicking the *Modify* button.

The detail of a report configuration is displayed after either the *Create* button or the *Modify* button has been clicked, as illustrated below:




The fields on this menu are as follows

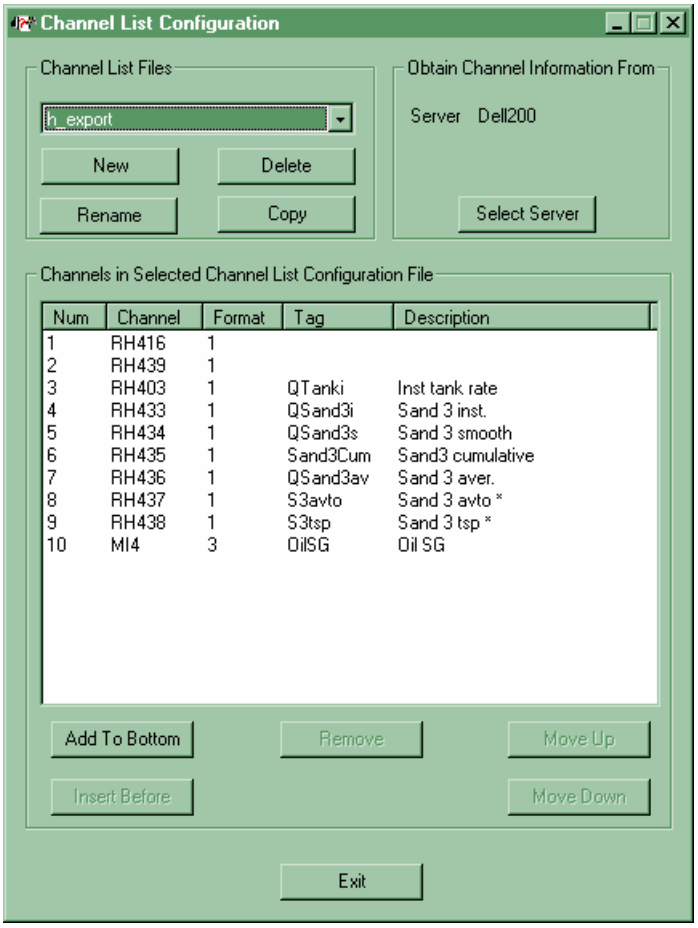
| | |
|---|---|
| Auto start | Changes between Yes and No. If set to Yes, the report will be automatically started when Orchestrator is enabled |
| Channel List File | Allows any of the configured channel lists to be selected, to define the channels to be reported |
| Report Frequency | Interval, in seconds, between lines of a report. The report is generated on even time boundaries |
| Report on Significant Change | If specified as Yes, a report line will be generated if any of the channels being reported has its significant change flag set |
| Port | Any of the serial or parallel ports on available on the system can be selected. The report is output to the selected port |
| Baud Rate | If the selected port is a serial port, this specifies the baud rate at which the report is output |
| Parity | If the selected port is a serial port, specifies the parity at which the report is output |
| Data Bits | If the selected port is a serial port, specifies the number of data bits at which the report is output |
| Output To | Lets the user select from a drop down list of available printers and printout styles. The available printers are defined in a simple text file (PRINTER.TXT in the \..\current_config directory), which contain details of the escape codes required to initialise the printer for the desired output style. In addition, the drop down list also contains a *Remote Computer* entry, intended for use to send output to a remote computer system. Output to a report computer is not paged, does not contain any initialising escape codes, and does not permit page based settings to be specified |

| | |
|---|---|
| Page Size | the number of lines on the page |
| Starting Page Number | The number to be printed at the bottom of the first printed page. Subsequent pages are printed with incrementing page numbers |
| Bottom Margin | The number of lines to leave at the bottom of each page. This must be at least 3 if the page number is to be included at the foot of each page |
| Left Margin | the number of spaces to print at the start of each line |
| Output Date | allows a choice of including the date at the start of each line, or on a single line only when it changes |
| Report Header - on First Page | Specifies whether or not the report header is to be included at the top of the first printed page. Note that this is NOT affected value specified for *Starting Page Number* |
| Column Headers - on Subsequent Pages | Specifies whether or not column headers are to be included at the top of the second and subsequent printed pages. Note that this is NOT affected value specified for *Starting Page Number* |
| Column Headers - on First Page | Specifies whether or not column headers are to be included at the top of the first printed page. Note that this is NOT affected value specified for *Starting Page Number* |
| Report Header - on Subsequent Pages | Specifies whether or not the report header is to be included at the top of the second and subsequent printed pages. Note that this is NOT affected value specified for *Starting Page Number* |
| Use Four Digit Years | Specifies whether to use two or four digit years in the report |
| dd/mm/yyyy<br>mm/dd/yyyy<br>yyyy/mm/dd | Allows the date format to be selected, there are three options plus the option to have wither two digit or four digit years. The text of the options change depending on whether two digit or four digit years are selected |

Note that although the date format is configured at the level of an individual report, it is a global setting, i.e. it needs to be specified only once, not for each report.

## 4.10 CHANNEL LIST CONFIGURATION

Channel lists are used by all the reporting software, and define the channels to be printed, and their format. When the Channel List Configuration program is started, the following dialog is displayed:




The name of the selected channel list file is displayed on the top left of this dialog. A different channel list file can be selected by dropping this box down and clicking on another file. Options are available to:

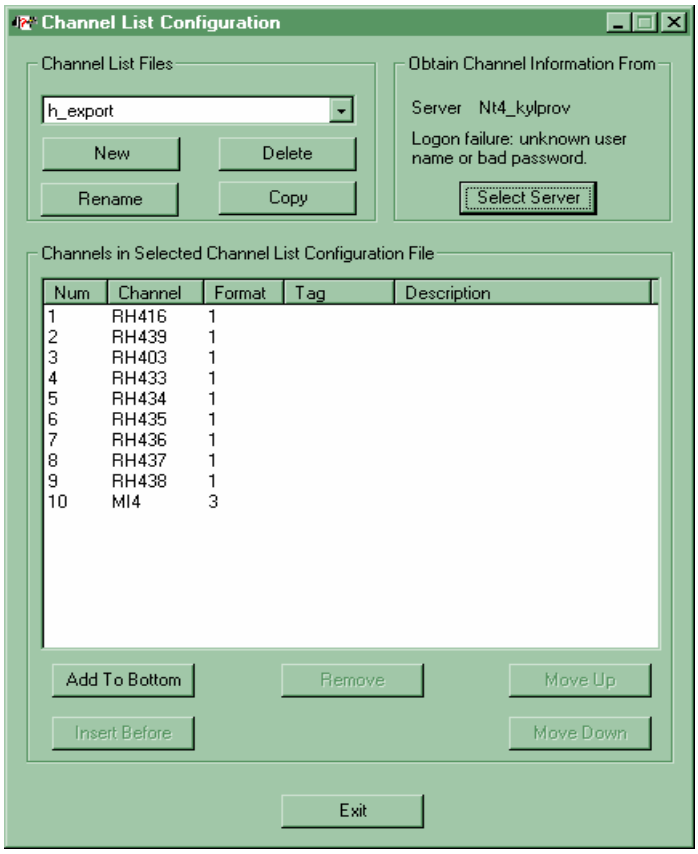
- create a *New* channel list file from scratch
- *Rename* the selected channel list file
- *Delete* the selected channel list file
- *Copy* the selected channel list file to a new file

The channels that are in the channel list file are contained in a list box in the middle of the dialog. If there are more channels than can be displayed in the box, scroll bars will appear to allow the extra channels to be scrolled into view.

Beside each channel is a format, which defines the number of decimal places that will be used to display the value. Values are reported in a field width of 9, including leading minus sign and decimal point, if required. If a value is larger than can be put into a field width of 9, it will be reported with fewer decimal places than specified, or it will be reported in exponential format. Negative values will be reported as zero, unless the channel format includes a minus sign.

Up to 240 channels can be entered in a channel list.

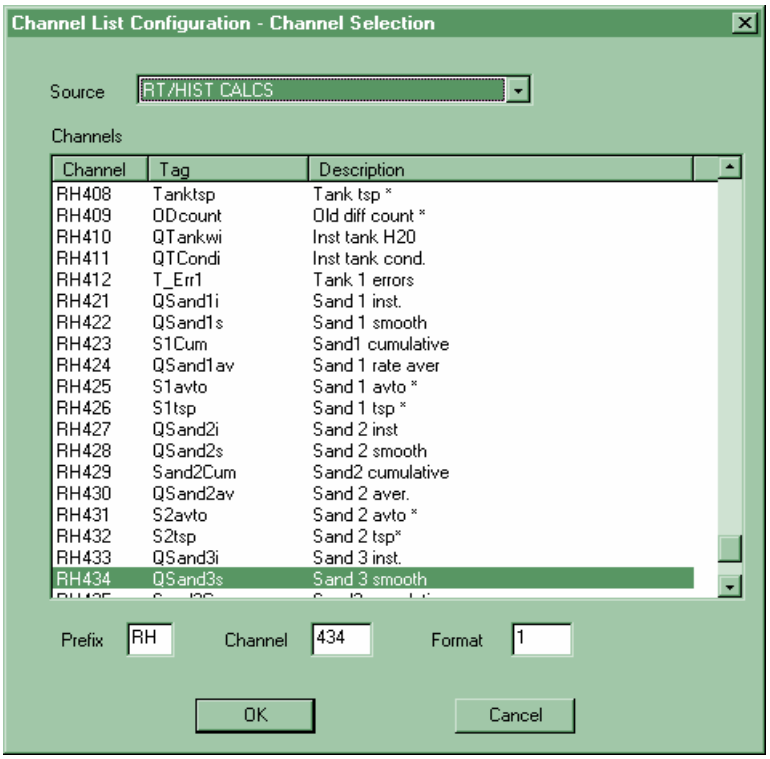
The tag and description of each channel in the channel list file is also displayed. By default, the system assumes that these descriptions are available on the current PC. However, the *Select Server* button allows the user to select a remote Orchestrator server PC from which the tags and descriptions are read. Note that the logged on user must have access rights to the selected PC, otherwise an error message will appear, as illustrated below:




A new channel can be added to the bottom of the list by clicking the *Add to Bottom* button. Alternatively, if a channel in the list is highlighted (by clicking on it), the *Insert Before* button allows a new channel to be added immediately before the highlighted channel. The highlighted channel and all channels below it are shuffled down to make room. The *Remove*, *Move Up* and *Move Down* buttons are also available when a channel has been highlighted. *Remove* deletes the selected channel, shuffling up the channels below. *Move Up* and *Move Down* change the position of the channel in the list, and hence where in reports the channel will appear.

Double clicking on a channel in the list box allows the channel or its format to be changed.

When a channel is added (with either *Add to Bottom* or *Insert Before*) or double clicked, a dialog allowing the channel to be selected by source and channel number is displayed:




The channel can be selected either by selecting the source from the drop down box at the top of the screen and then selecting a channel from that source, or by entering the prefix and channel number at the bottom of the screen.

### 4.11 UNITS SELECT

These options are a main system configuration at start of test, which must NOT be modified once system is configured.

See ‘System Configuration - Units’ section for detailed explanation.

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# 5. CONFIGURATION

## 5.1 INTRODUCTION

**This section covers important topics on system configurations. Extreme caution must be observed and changes undertaken by competent personnel only.**

The following summarises typical channel concepts.

**(DS)** Datascan channels are the physical source of standard 4 - 20 ma/digital pressure, temperature, differential, floco, etc.

They are not normally used for reporting or logging to disk.

**(C)** Built in processor by Orchestrator to enable user defined calculations.

They are often used as system outputs but have an inherent built-in function that prevents them from any update historically.

i.e. Data calculated at real time and saved in C channels cannot be modified.

'Calculated' is an ambiguous term which encourages confusion from the (RH) channels which are also calculable but can be modified as per following summary.

**(RH)** Real Time/Historic channels are the primary reporting channels for all system outputs.

DS channels are initially diverted into these as well.

Although this can appear to be an unnecessary duplication, they are used to produce varying user-defined units and tags.

Main use of RH channels is for calculations, Flowrates, etc., and can be dynamically updated in real time and historically.

**(MI)** Manual Input channels have their source from keyboard entry and are used to modify (RH) channels as appropriate.

Manual inputs are supported with their individual file per logger.

The above 4 sections summarise the most common type of channel available.

There are many other channel descriptors depending on application..

Refer to the relevant 'Device' or 'Processor' for information on alternative channels.

## 5.2 DATASCAN SYSTEM

Add or Modify Transducer Parameters (DATASCAN Device Configure)

Access DEVICES ⇒ DATASCAN ⇒ CHANNEL GROUP ⇒ CHANNEL ⇒ CONFIGURE CHANNEL

**Analogue Channels** Enable/disable each channel as appropriate

**Tag *{field}***

Each channel must have a unique tag name (8 char's maximum). E.g. WHP

**Description *{field}***

A 16 character Alphanumeric Field in which you can give the channel a more meaningful description.

**Mode *{field}***

For 99% of our applications this will be set to 4-20mA. For the other 1% see Orchestrator user manual,

**Units *{field}***

This is the unit's description for the channel e.g. PSIG or DEGF (4 chars max.)

**CNV Law** {***field}*** default = **None**

Possible values are none and 1-4. These numbers are for conversion laws to be applied to the measured input.

**REF *{field}*** default = **deselected**

If selected then channel is set to zero when user executes the zero control option from the ScadaPro main system.

**Range** {***field}*** default = **Auto range**

This enables the system to select the appropriate range for measurement.

**RES *{field}*** default = ***16bit***

This gives a 16-bit resolution when interpreting the input signal.

14 bit reduces resolution.

**Scaling *{field}***

There are three fields used to calibrate input channels.

Select/deselect If selected then enter slope and offset. If deselected, input will be 0-100%

Slope - Enter transducer span/ 100.

Offset - Enter transducer zero reading.

| For example: | Slope | Offset | |
|---|---|---|---|
| | 50 | 0 | for a 0 to 5000 psig press trans. |
| | 3 | -20 | for a -20 to 300 degF temp trans. |

**SIG Change *{field}*** default = **deselected**

There are two fields. Select/deselect and change value. If selected and a value is input (e.g. 10) this means for this channel if one scan changes by more than 10 from the last scan, an event will occur. This event can then be logged. The value is in engineering units of the particular channel.

**Event checking *{field}***

If selected: Enter High and Low fields.

High & low these are the range in which normal operations will take place

Values outside this range will trigger an event. The numbers can be positive or negative.

**Alarm checking *{field}***

If selected: Enter High and Low fields.

High & Low These are the range in which normal operations will take place.

Values outside this range will trigger an alarm.

**COM ALM *{field}***

If selected indicates that this channel is one of several that can trigger an alarm on the common output channel.

**Digital Channels** Enables/disables each channel as appropriate

**Tag *{field}***

As per analogue channel

**Description *{field}***

As per analogue channel

**Mode *{field}*** default = **Counter**

Determines digital input as either counter or frequency

**Units *{field}***

As per analogue channel

**Conv Law *{field}*** default = **None**

As per analogue channel

**Debounce *{field}*** default = 0.128 ms

Very important factor which affects the channel counting, in specific modes (counter, frequency, etc)

**FLOCOS = COUNTER MODE @ 0.128 MS (MANDATORY!)**

**Scaling *{field}***

As per analogue channel

**SIG Change *{field}*** default = **deselected**

As per analogue channel

**Event checking *{field}***

As per analogue channel

**Alarm checking *{field}***

As per analogue channel

**Expansion Datascans**

Standard interfaces support

- ❑ 16 analogue channels.
- ❑ 8 digital channels.

Additional channels required are achieved by connecting up interfaces via their rear panel network connectors.

Secondary interfaces require alternate DIP switch settings to connect into network. See Appendix A for Switch Settings.

To configure ScadaPro for additional Datascans/Channels:

Access DEVICES ⇒ DATASCAN

Select DS33 - 40 inactive group (or next spare group as appropriate)

Select Configure Module option.

**Module Type *{field}*** default = **inactive**

Select 7220 option for additional analogue channels.

Select 7041 option for additional digital channels.

NB. 7220 & 7041 are standard units. Other models may be used depending on application. (Fixed installations, etc)

Set channel parameters as per previous section.

**Filtering Datascan Inputs**

ScadaPro has the inbuilt facility to invoke a filter across its inputs, which in effect provide a rolling average of the monitored channel.

Access DEVICES ⇒ DATASCAN ⇒ ADVANCED CONFIGURATION

**Conversion Law Type 1 *{field}*** default = **filter for 1 and undefined for 2 - 4**

See ScadaPro manual / on-line help for alternative options.

**Constant 1 A *{field}*** B, C, D are inactive in filter mode

Enter 0.3

System is capable of applying any one of 4 conversion laws.

The numeric 1 - 4 option (1 in this case) is entered into the appropriate channel conversion law field.

NB: With a filter applied, a response time lag can be apparent and is not recommended for critical Wellhead monitoring.

The following criteria should be noted.

0.3 factors equates to circa 06-sec delay

0.2 factors equates to circa 15-sec delay

0.1 factors equates to circa 30-sec delay

(0.1 evaluates the best possible averaging at the expense of worst response times).

Differential channels should always have filtering.

## 5.3 MANUAL INPUT PROCESSOR CONFIGURE

**Manual Input Layout Definition**

Manuals input layout definition files are plain text files (i.e. they must have a .TXT file extension) and are stored in an Orchestrator configuration subdirectory called ***LAYOUTS*** (normally ***\EdgeX\CURRENT_CONFIG\LAYOUTS***). As such, they can be configured with any standard text editor, such as Notepad. The file is split into two parts. The top part of the file defines the layout, and comprises plain text and place-markers where manual input values will appear. The bottom part of the file specifies the manual input channel numbers that will be displayed in the layout. A line containing *&&&* separates the two parts of the file. The file used to generate the ***meters*** layout displayed above is

| | <Stage1> | <Stage2> | <Stage3> | Defaults |
|---|---|---|---|---|
| Meter Factor 1 (Oil) | xxxxxxxx | xxxxxxxx | xxxxxxxx | 1 |
| Meter Factor 2 (Oil) | xxxxxxxx | xxxxxxxx | xxxxxxxx | 1 |
| Meter Factor 3 (Oil) | xxxxxxxx | xxxxxxxx | xxxxxxxx | 1 |
| Meter Factor 1 (H2o) | xxxxxxxx | xxxxxxxx | xxxxxxxx | 1 |
| Meter Factor 2 (H2o) | xxxxxxxx | xxxxxxxx | xxxxxxxx | 1 |
| Meter Factor 3 (H2o) | xxxxxxxx | xxxxxxxx | xxxxxxxx | 1 |
| Conversion Units | xxxxxxxx | xxxxxxxx | xxxxxxxx | 0.01 |
| (Counts to Bbls) | | | | |
| Period Averaging (Secs) | | xxxxxxxx | | |
| Log Smoothing Factor – Oil | xxxxxxxx | | (0 - 0.9) | |
| Log Smoothing Factor – Gas | xxxxxxxx | | (0 - 0.9) | |

&&&

7,125,225

8,126,226

9,127,227

10,128,228

15,141,245

16,142,246

29, 41, 42

38

39

40

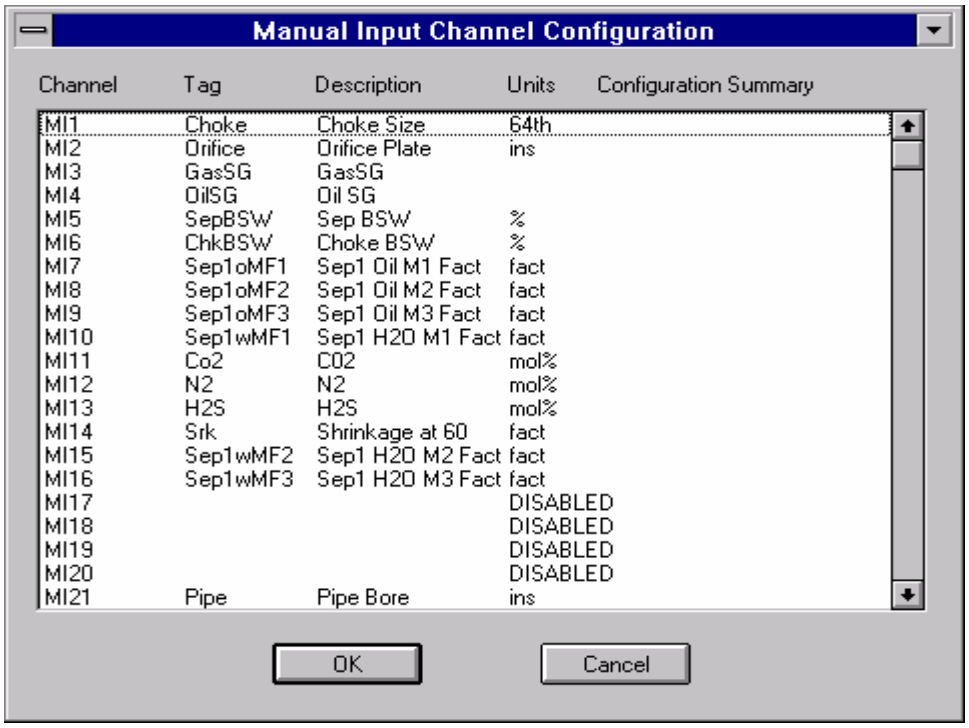
All plain text appears exactly as in the file. All occurrences of xxxxxxxx will be replaced by a manual input value, to the width specified by the number of x's; this width includes an allowance for a trailing space and asterisk/exclamation mark, used to highlight values that have been changed at this time. The bottom part of the report layout file defines the manual input channel numbers in the order that they are to be used, i.e. the first xxxxxxxx in the top part of the file corresponds to the first channel number in the bottom part of the file, and so on. To assist in assigning channels correctly, channels on the same line of the layout are defined on a single line, separated by commas. If more channels are defined on a line than appear in the layout, these extra channels are ignored.

**Font for layout fields should be set to 'Courier' (or any Fixed font)**

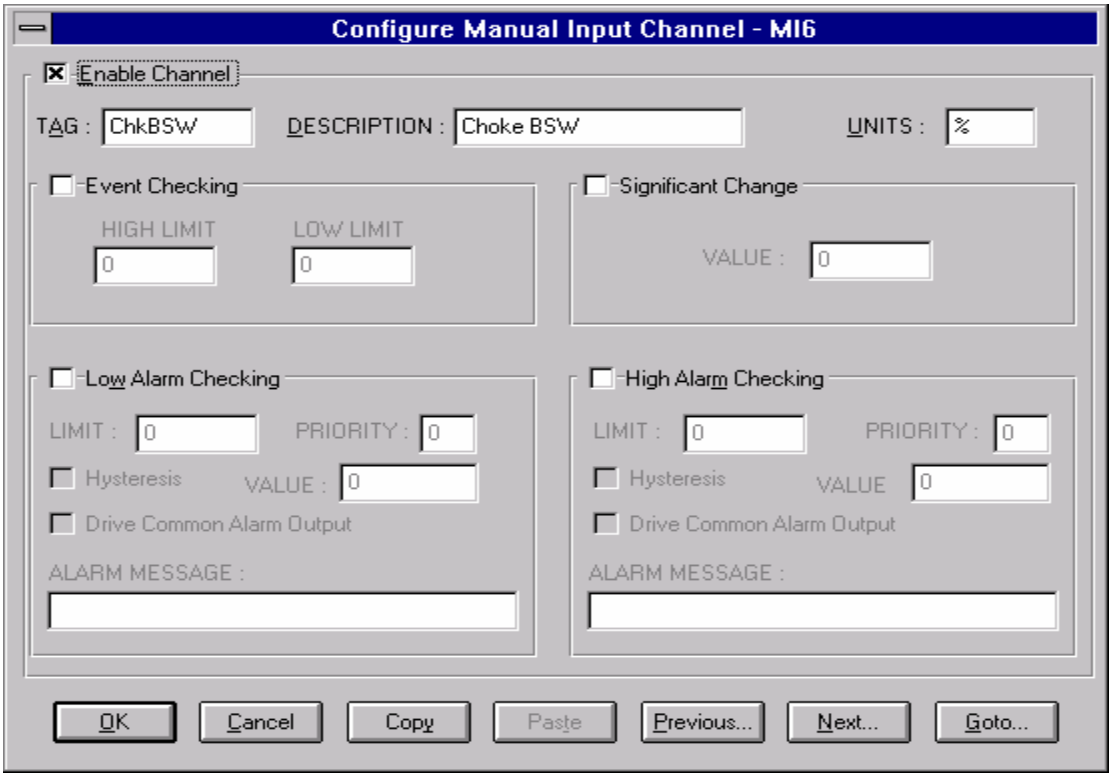
**Do NOT use TAB characters!**

**Configuring Manual Input Channels**

The system maintains the current values of the manual input records in channels. Tags and descriptions, etc., for these channels are configured by the selecting the Manual Inputs option from the Processors menu on the top level Orchestrator window. When this option is selected, a menu displaying summary configuration information about the manual input channels is displayed:




Double clicking on a channel calls up a screen to configure the selected channel:




The ***Cancel*** button discards any changes made on this menu. However, the *OK* button does not commit any changes made to disk until the *OK* button on the manual input channel summary menu is clicked. If changes are made to several channels, using the ***Previous***, ***Next*** or ***Goto*** buttons, clicking on the ***Cancel*** button discards changes made to all the channels. However, the ***OK*** button does not commit any changes made to disk until the ***OK*** button on the manual input channel summary menu is clicked.

Optional

Access LOGGERS ⇒ LOGGER NAME ⇒ CONFIGURE CHANNELS

Ensure you add the new MI channel(s) to the logging lists if you wish to reproduce the channels historically with the final report.

## 5.4 CALCULATOR PROCESSOR CONFIGURE

Built in ScadaPro processor which is generally unused by EdgeX system.

Access PROCESSORS ⇒ CALCULATED CHANNELS

***Warning!***

***Existing C channels may be linked into various source codes.***

***Use extreme caution and check existing list assignments in this manual.***

***C Channels cannot be used for re-calculation purposes.***

Double clicking on a channel calls up a screen to configure the selected channel:

All the fields on the menu are standard ScadaPro channel fields.

Refer to ScadaPro Manual and/or Online help for additional information.

The *Cancel* button discards any changes made on this menu. However, the *OK* button does not commit any changes made to disk until the *OK* button on the manual input channel summary menu is clicked.

Optional

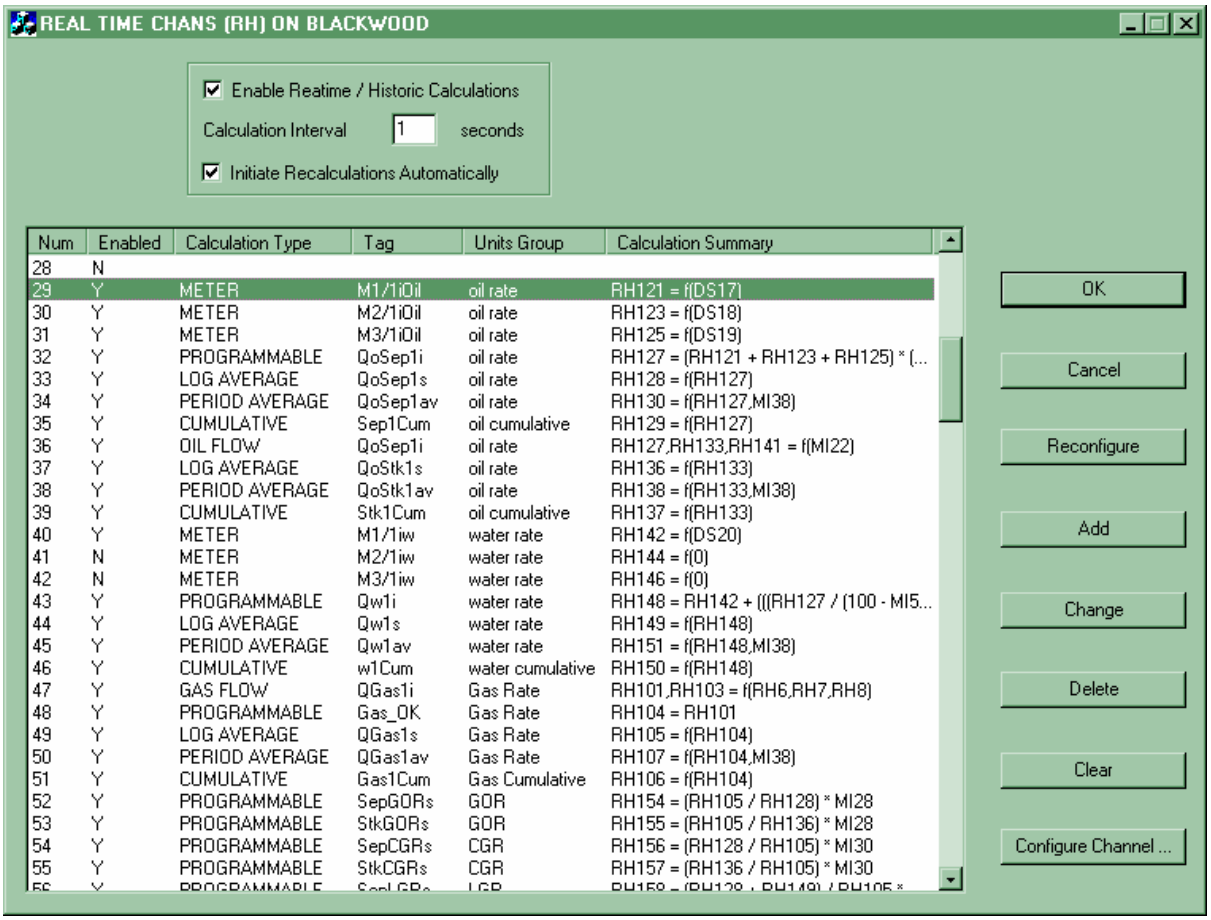
Access LOGGERS ⇒ LOGGER NAME ⇒ CONFIGURE CHANNELS

Ensure you add the new C channel(s) to the logging lists if you wish to reproduce the channels and any related rates, etc. historically with the final report.

## 5.5 REAL TIME PROCESSOR CONFIGURE

Calculation Configuration

Real-time / historic calculations are configured by selecting the real-time / historic processors from the Orchestrator PROCESSORS menu. A menu that displays the current calculation configuration is displayed, as illustrated below:




The box *Enable Real-time / Historic Calculations* must be checked to enable calculations on the system.

*Calculation Interval* defines the rate at which real-time calculations are performed.

The box *Initiate Recalculations Manually* toggles between the two modes of recalculation Automatic (when the box is checked) and Manual (when the box is cleared).

Summaries of all the calculations on the system are listed. These calculations are performed in the order in which they are defined.

New calculations can be added at the desired position by clicking on the *Add* button. This prompts for the position of the calculation and the type of calculation to be inserted. The calculation already at the specified position (if any) and all subsequent calculations are moved down one position to make way for the new calculation.

Calculations can be removed by selecting the relevant calculation (by clicking on it) and then clicking either the *Delete* button or the *Clear* button. The difference between the two is that the *Delete* button moves all the calculations below the deleted calculation up on position, whereas the *Clear* button does not.

Each different calculation type has a specific menu to configure the channels or constants required by the calculation. This menu is called up either when a new calculation is inserted (as described above), or when an existing calculation is modified. A calculation is modified by selecting it (clicking on it), and then clicking on the *Change* button, or double clicking on the calculation.

The types of calculation which are done on the system are as follows:

| | |
|---|---|
| Choke | calculate gas flow from pressure |
| Differential | a calculation whose result is the increase in the value of an input |
| Down hole | calculate temperature and pressure from down hole gauge frequencies |
| Gas Flow | calculate gas flow from pressure |
| Logarithmic Average | smooth an input |
| Oil Flow | calculate oil flow at stock tank conditions |
| Meter | convert pulses from a meter into a flow rate |
| Period Average | average an input over time |
| Programmable | an arithmetic calculation that uses the simple operators multiply, add, subtract and divide |
| Cumulative | calculate the total of an input over time |
| Programmable | calculation to do simple arithmetic operations (add, subtract, multiply and divide) in simple left to right order, unless overridden using parenthesis |
| Pseudo Pressure | does a polynomial calculation on pressure input |
| Manual Tank | does an oil flow calculation based on manual inputs for how much the level in a settling tank increases over time |
| Choke Oil Rate | does a calculation to estimate the oil flow based on the wellhead pressure and the choke size |
| GOR2 | does a gas / oil ratio calculation based on the shrinkage |

The calculator also has an extensible interface, allowing additional calculations to be added. The list of calculations above will therefore typically be incomplete. Documentation of what these additional calculations do and those extending the calculations in this manner should provide the inputs to these calculations.

The configuration menus for each type of calculation prompt for the information that is currently code-configurable in the current OS/9 system. For instance, the menu to configure a meter calculation requires the following:

- output channel that holds the calculated flow rate
- output channel that holds the previous meter reading
- input channel that holds the counter input
- constant for the meter factor
- constant for the units factor

Output channels must have the channel prefix used by the real-time / historic calculator (typically RH), or they can be blank. If they are left blank, then no value is stored for the corresponding output. If the incorrect channel is left blank, then the calculation result may not be available, or recalculations may generate an error. The only safe output channels to leave blank are the intermediate result output channels (Fb, etc.) of a gas flow calculation.

Beside each output channel is a button labelled `Configure`. Clicking this button calls up a menu to configure the output channel - its tag, description, alarm limits, etc..

All other inputs can either be a channel specifier, or a number. The calculation is done using either the current channel value or the number. Obviously, it is not sensible to specify some input as numbers - for instance, entering a fixed number for the counter input of a meter calculation will result in a flow rate of 0, as the input never changes! If an input is left blank, it is treated as if the number 0 had been entered.

Every calculation has a flag that specifies whether or not the calculation is to be performed. This flag is displayed on the calculation summary menu displayed above. None of the output channels of a calculation that is not performed are set in any way. It is therefore possible, although not recommended, for two calculations to have the same output channels, provided that at any one time only one of the calculations is performed. Because of the confusion that could result if two calculations share the same output channel, the system checks the channels used for each calculation and reports any occurrences of a channel used in one or more calculations, regardless of whether one of the calculations is not performed. This check is run when the configuration menu is started, when a calculation is added or changed, and when the calculations are saved.

There is however one situation where the system may be configured so that two calculations use the same output channel. This occurs when measuring oil flow. Oil flow can be measured in one of two ways, via meters, or via flow into a tank. A meter calculation take pulses that indicate flow, the rate of increase of these pulses is used to calculate flow rate. The outputs from a meter calculation are piped into an oil flow calculation, which calculates oil flow at separator and at stock tank conditions, accounting for the temperature and pressure where the flow was metered, dissolved gas, and sand and water in the flow. The output from the oil flow calculation is normally smoothed, averaged and totalled (three separate calculations). However, if the oil flow is too small for accurate metering, the flow may be measured using a Manual Tank calculation. This calculation uses the increase in the tank level over time (both the increase and the time over which it is measured are manual inputs entered by the operator) and calculates the total flow and average flow rate. The system therefore does not report a conflict between the output of a total calculation and the total output of a manual tank calculation, nor between the output of an average calculation and the flow rate output of a manual tank calculation, *if these calculations refer to the same flow*. An input channel to all these calculation, *Use Manual Tank*, is used to link these calculations together. If they share the same manual input channel for *Use Manual Tank*, then no channel conflicts are reported.

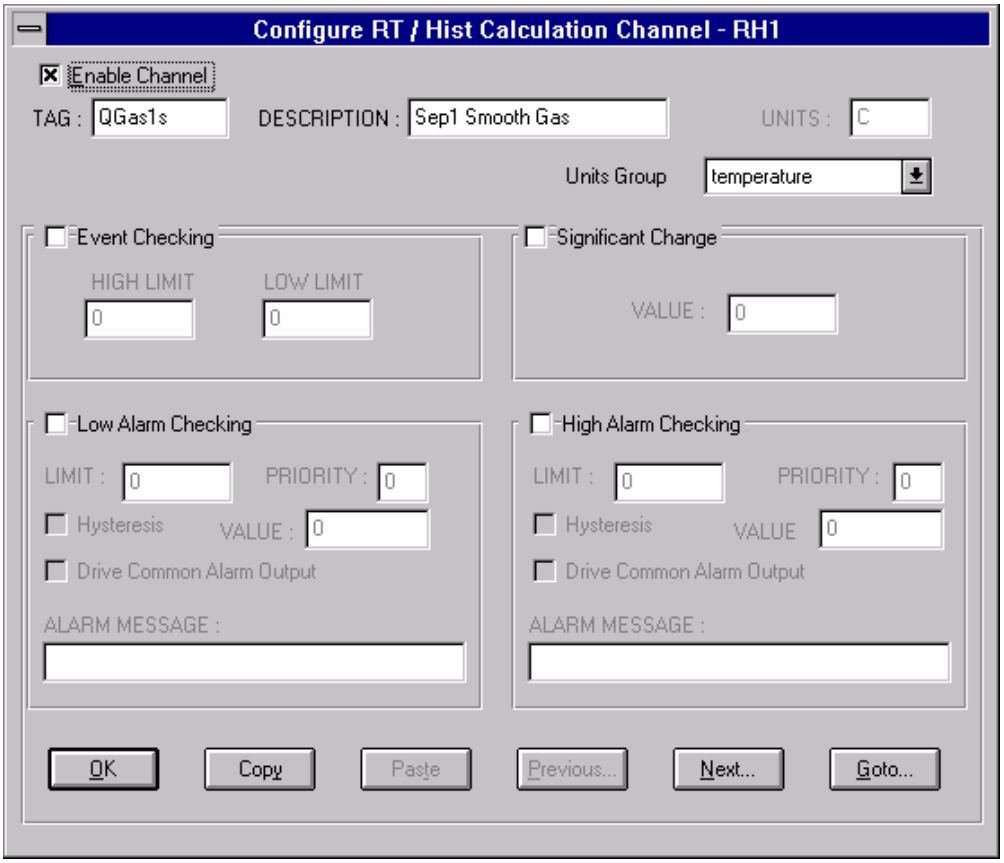
Furthermore, the value of this channel is used to indicate whether to do the manual tank calculation, or the suite of oil flow, smoothing, averaging and totalling calculations. If the value of the `Use Manual Tank Input` manual input is 1, then only the Manual Tank calculation is performed. All the outputs from the oil flow calculation are set into error. The smoothing, averaging and totalling calculations are not performed, the system behaves as if these calculations were not configured. If the value of the *Use Manual Tank Input* manual input is 0, then the oil flow, smoothing, averaging and totalling calculations are done normally. The Manual Tank calculation is treated as if the calculation were not configured.

For smoothing, averaging and totalling calculations that are not associated with oil flow, the *Use Manual Tank* input should be left blank.

The *OK* button and the *Reconfigure* button both save any changes made to the calculation configuration and to the channel configuration and instruct the system to act on this new configuration immediately. The difference between the two options is that *OK* terminates the program whereas *Reconfigure* does not. The *Cancel* button asks the user to confirm whether any changes made since the last time they were saved are to be saved or discarded, including any channel configuration changes.

## Channel Configuration

The channels maintained by the real-time / historic processor must be enabled, and configured to have tags, descriptions and alarm limits, etc., in the same way as all other Orchestrator channels. Clicking on the *Configure* button beside any output channel on one of the calculation configuration screens calls up a menu to let that channel be configured, as illustrated below.




With the exception of the *Units Group* field, all the fields on this menu are standard Orchestrator channel fields. The *Units Group* field offers a drop down list of all the units groups that have been configured in the system, plus the option None, to specify that the channel does not belong to any units group. If the units group is changed, the short name for the selected units of that group are copied into the units field of the channel, where they cannot be changed. Only if no units group is selected is it possible to type anything into the units' field of the channel.

The *OK* button does not commit any changes made to disk until both the *OK* buttons on the calculation-specific configuration menu and either the *OK* button or the *Reconfigure* button on the calculation summary is clicked.

The calculation summary menu has a button *Configure Channel.* When this is clicked, the user is prompted to specify the channel number of interest, and the channel configuration screen for that channel is displayed. In this way, it is possible to modify the channel configuration without going through a calculation configuration menu first

## 5.6 LOGGER CONFIGURE

**Concepts**

Logging specifically refers to saving channels to the current Logfile. All system channels can be monitored in real time, however, channels **cannot** be reproduced if they are not logged to disk.

The following summarises important logging concepts.

Additional and detailed information can be found in Orchestrator manual and real time on-line help.

See 'Logged to Disk - Channel Assignments' section for default lists.

ONLY the first logger (commonly referred to as Top Level logger) can be:

- Controlled by system log rate icon
- Capable of data regeneration (recalculation)

Secondary loggers are useful to set-up specific channels, which may require fast trending etc.

Data in different loggers and files cannot be reproduced on single trend.

However, separate trends can be opened simultaneously with different data, loggers, etc.

Also, there is a Logfile merge routine that users can activate to concatenate files together.

***(Warning. Do not merge files that have different channel structures saved in the log files)***

Secondary loggers log rates are set by the scan field option local to each logger.

**Access Loggers**

Access LOGGERS ⇒ LOGGER NAME ⇒ CONFIGURE CHANNELS

Main logger display defines the way in which the logger operates and the name of the Logger.

**Logger name *{field}***

This will be the folder within ***EdgeX\LOGGED_DATA**\ into which the data log files are stored.

You cannot create a new logger name unless the existing logger is disabled.

**Auto start *{field}***

Should always be enabled in case of system power down

**Logger Type *{field}*** default = **Period**

This determines that logs are recorded on a time basis only. Advanced configurations can accept that events are set up, which can then trigger the logger to record additional readings over and above a time base.

**Logging Rate *{field}*** default = **1 minute**

This determines the rate that records are updated into the Logfile.

The logging rate icon option from the main program group will override this value during active sessions. However any system re-enables or power downs will revert to the value set in this field.

**Start Mode *{field}*** default = **append**

***Create***

This creates a new log file every time logger is started.

**Append**

Maintains one continuous logfile by continually appending to end of existing file from re-enables and power start-ups.

**Start time** default = ****/**/** **:****

Wildcard ensures logger starts up under user control instantaneously.

**Stop time** default = ****/**/** **:****

Wildcard ensures logger remains active unless terminated by user control.

**Delete Logs *{field}*** default = **disabled**

A disabled is mandatory to avoid losing logfiles. Users can manually delete logfiles in program manager if necessary.

**Cycle Mode *{field}*** default = **on time**

**Every = month**

**Log for = month**

**Select Channels**

This specifies how and which channels are to be logged.

**Channels *{field}***

Double click on any existing or new field to activate prompt entry for type of channels to log. (Device or Processor type)

**Avg. *{field}*** default = **disabled**

Enabling this field will apply system averaging on the selected block of channels.

Additional blocks of channel fields will appear on lower half of screen depending on **logger type {*field}*** setting

## 5.7 SRO & ASCII DEVICE/PROCESSOR CONFIGURE

Introduction

Down hole data can come from one of two sources:

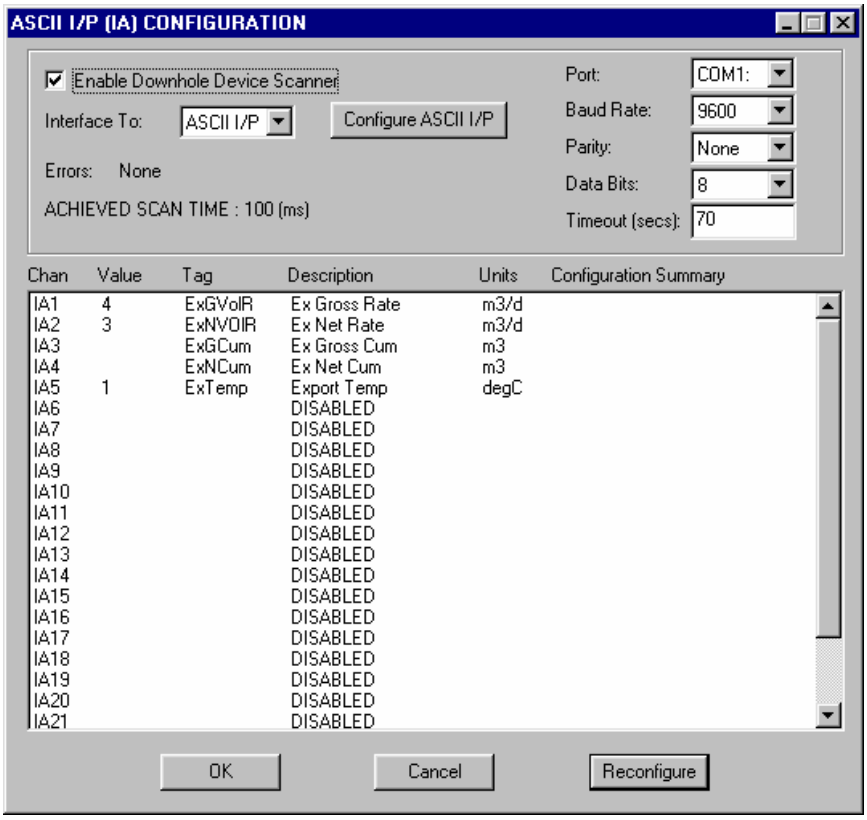
- GSC device (EXPRO SRO option)
- PC (ASCII import)

Both these devices are assumed to send real-time data. The system can support as many devices, of either type, as there are serial ports on the system.

The following description refers to down hole device configuration, however when system is in PC DEVICE mode, any 3rd party data is transferred to system. (E.g. Sand monitors, Export metering, etc.)

Down hole Device Configuration

Access to the down hole device configuration is via the Orchestrator DEVICES menu. Selecting this menu displays a list of all the devices in the system. Selecting one of the down hole devices displays the following menu:



The fields at the top of the screen are as follows:

| | |
|---|---|
| Enable Down hole | This box must be checked to enable communications with the device when Orchestrator is enabled |
| Interface To | Used to define the device type, either ASCII/IP or GSC |
| Configure GSC | this button is only available if the interface type is GSC, and calls up a menu to configure the GSC-specific information, including the gauge types and gauge coefficients. |
| | Configure ASCII I/P this button is only available if the interface type is ASCII I/P, and calls up a dialog to configure the ASCII Input-specific information. |
| Port | The comms port to be used by this incarnation of the down hole device scanner |
| Baud Rate | Baud rate at which the interface communicates |
| Parity | Parity of data used by the interface (NONE, ODD, EVEN, MARK or SPACE) |
| Data Bits | Number of data bits used by the interface (5 to 8) |
| Timeout | This is the time (in seconds) that defines how often the device is expected to send data. If 5 seconds longer than this time elapses without any data being received, a timeout error will be reported |
| Errors | If there is an error communicating with the device, a description of the error appears |
| Achieved Scan Time | When communications with the device are active, this displays how long it took to read the last set of information from the device. |

The box in the bottom half of the menu displays summary information about all the configured channels for the selected device. Channels are allocated as follows:

| | | |
|---|---|---|
| GSC Device | Channels 1,3,5,7 | Pressure frequencies for the four gauges |
| | Channels 2,4,6,8 | Temperature frequencies for the four gauges |
| | Channels 9,11,13,15 | Pressures calculated from the frequencies or depth if gauge 4 is depth |
| | Channels 10,12,14,16 | Temperature calculated from the frequencies or depth if gauge 4 is depth |

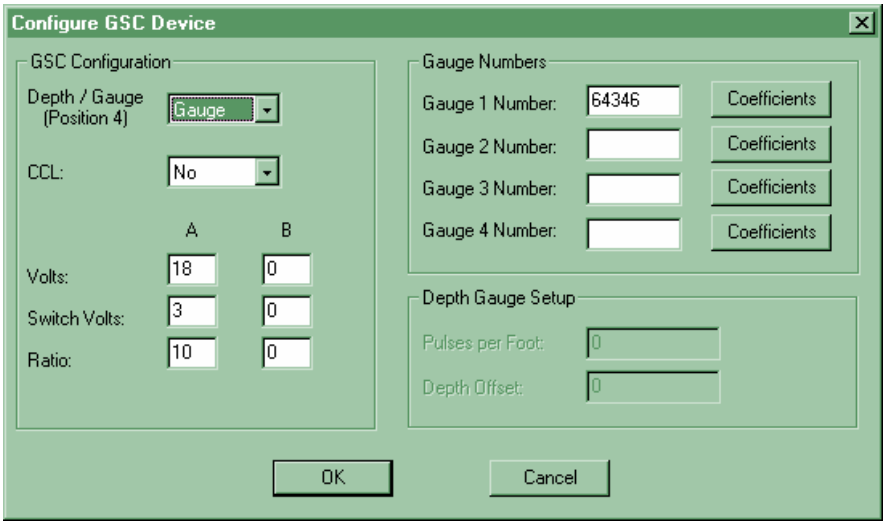
| | |
|---|---|
| PC Device | Mapping of values in the ASCII input streams are mapped to channels using the configuration dialog described below. The list box has an extra column, *Value*, which indicates this mapping, as illustrated on the dialog displayed above |

The three buttons along the bottom of the screen are as follows:

| | |
|---|---|
| OK | Save any changes made and exit. This includes any changes made on the GSC configuration screen or on the channel configuration screen. Any changes made will not be acted on until the next time Orchestrator is enabled, or until the Reconfigure button is clicked. |
| Cancel | Cancel any changes made and exit. This includes any changes made on the GSC configuration screen or on the channel configuration screen. |
| Reconfigure | Save any changes made, instruct the system to act on these changes but do not exit. This button is only available if the down hole device is currently active. |

GSC Configuration

If the interface type is specified to be GSC, the *Configure GSC* button is enabled. Clicking on this permits the GSC-specific configuration parameters to be entered using the menu below:




| | |
|---|---|
| Depth / Gauge (Position 4) | specifies the type of device connected to channel 4, and can be toggled between Gauge and Depth |
| CCL | can be either Yes or No, and is downloaded to the GSC interface |
| Volts | the volts to be output by the controller box to the gauges when requesting the pressure frequency. Two voltages are required. The A group is for the gauge on channel 1; the B group is for the gauges on channels 2, 3 and 4 |
| Switch Volts | the amount by which the controller box should drop its output voltage when requesting the temperature frequency for gauge 1 (switch volts A) and gauges 2, 3 and 4 (switch volts B) |
| Ratio | the ration of pressure to temperature measurements made by the controller box for gauge 1 (ration A) and gauges 2, 3 and 4 (ration B) |
| Gauge numbers | the number of the gauges connected to the GSC device. If fewer than four gauges are connected, the device number can be left blank. A number is not required for gauge 4 if its type has been specified as Depth. Beside each gauge number is a button labelled *Coefficients*. Clicking this button will call up the gauge coefficients for inspection. See section 5.7.3 for more details. |
| Depth Gauge Set-up | if the gauge 4 type has been specified as Depth, values for the Pulses per Foot and Depth Offset are required. |

Clicking the *Cancel* button to discard any changes made on this menu. Note, however, that clicking on the *OK* button does not save the changes made; to save the changes; either the *OK* button or the *Reconfigure* button on the device configuration menu described in section 5.7.1 must be selected.

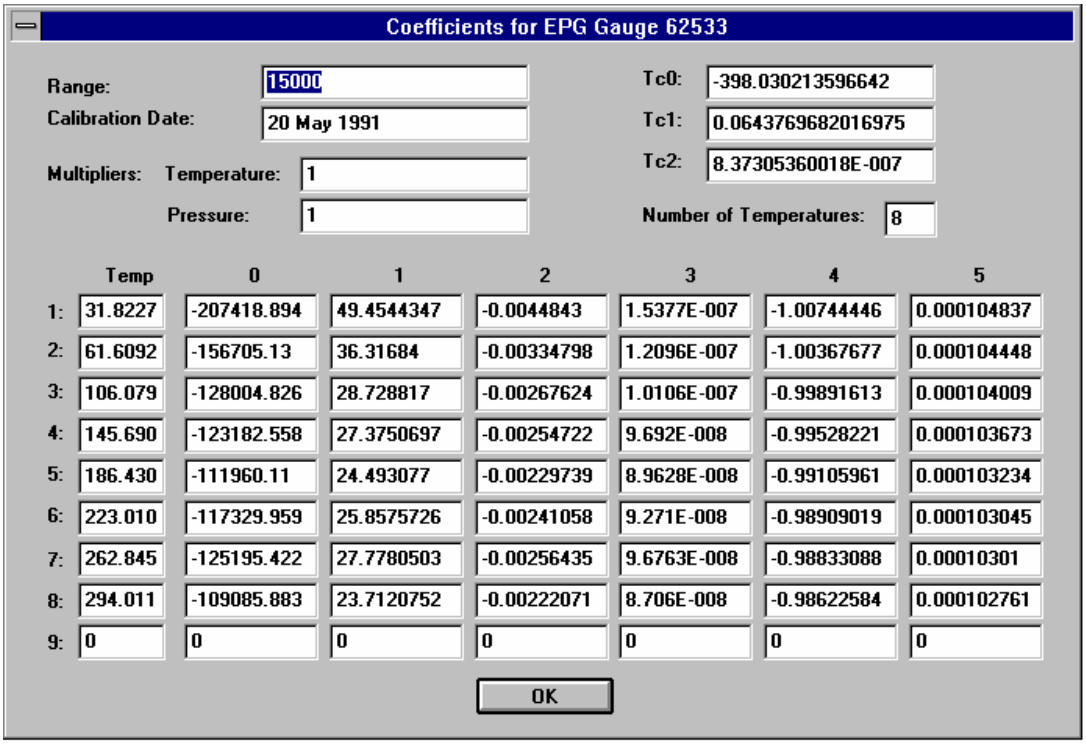
Gauge Configuration

Gauge coefficients are required for all the gauges connected to a GSC device, to enable temperatures and pressure to be calculated from the frequencies reported by the device. Three types of gauge are supported by the system:

- EPG
- HP
- Quartz dyne

The system expects to find gauge coefficients in an Orchestrator sub-directory called GAUGES (normally ***\EdgeX\GAUGES***) in a file called ***gauge number. CAL.***

The coefficients of a gauge can be inspected, but they cannot be changed, by clicking on the *Coefficients* button on the GSC configuration menu described in section 5.7.2 above. The gauge coefficients for the selected gauge are then displayed - the menu varies depending on the gauge type, the example menu illustrated below is for an EPG gauge

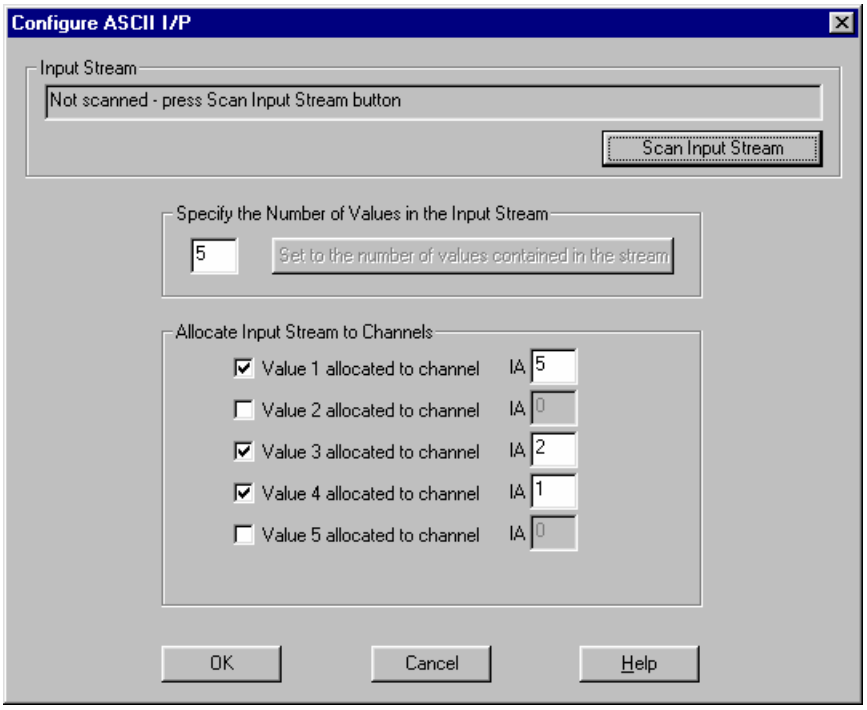



Clicking on the *OK* button returns to the GSC configuration menu

## ASCII Input Configuration

If the interface type is specified to be ASCII I/P, the *Configure ASCII I/P* button is enabled.

Clicking on this permits the ASCII Input-specific configuration parameters to be entered using the dialog below:



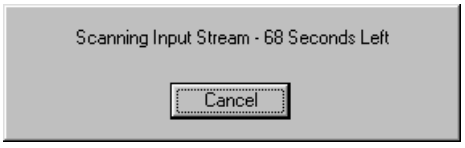

This dialog allows the ASCII input stream to be scanned, to view the values that it contains, and to allow these values to be mapped to Orchestrator channel values. The configuration above has specified that there are five values in the input stream, but only three of these (value 1, 3 and 4) are mapped to Orchestrator channels (numbers 5, 2 and 1 respectively).

The input stream can only be scanned if the COM port is not in use. If the input stream is in use, an error message (*Can't open COM port (Error #nnn)*) will be displayed when the button is clicked. This error message includes the system error code attempting to open the COM port, the most likely error codes are:

**2** the COM port does not exist.

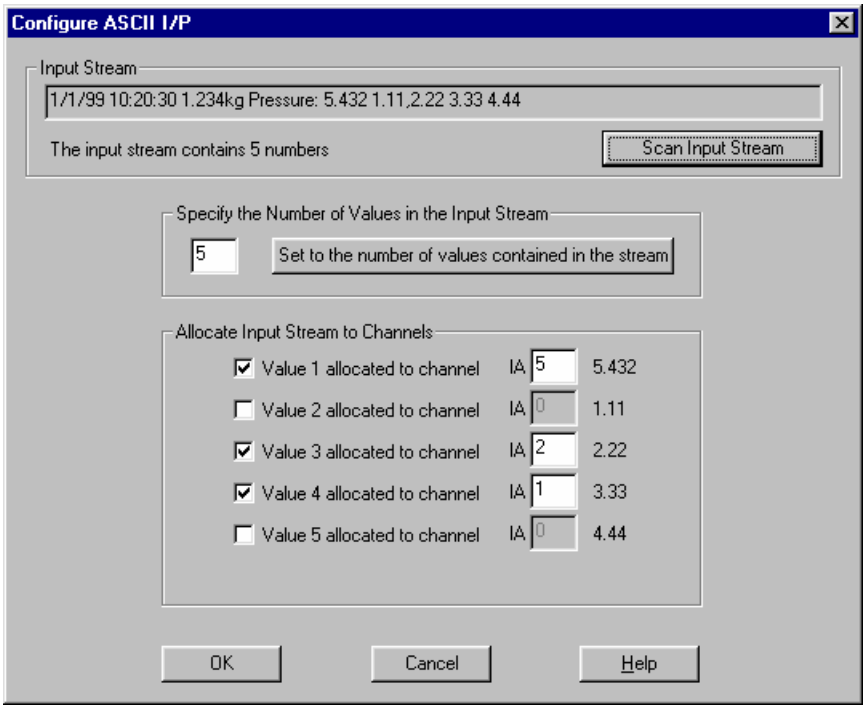
**5** the COM port is in use

While the ASCII input stream is being scanned, a dialog is displayed indicating how long is left until the scan times out:




The timeout starts at the value specified on the main device configuration dialog. Te *Cancel* button can be clicked to terminate scanning before this timeout has expired.

If the input stream is successfully scanned, what was read is displayed, and the dialog changes as follows:




The ASCII stream received is displayed, and is analysed to determine how many values it contains. Except at the beginning and end of a line, each value must be preceded and followed by either a space, a comma or a TAB character, or it is ignored. The date and time fields at the start of the stream are not separated in this way, so they are ignored. The *1.234* is also ignored, as it is immediately followed by *kg* with no space, comma or TAB. The remaining five numbers are acceptably separated, so the program sees five values in the ASCII input stream.

The button *Set to the number of values contained in the stream* is enabled, and configures the device to have the number of values contained in the input stream.

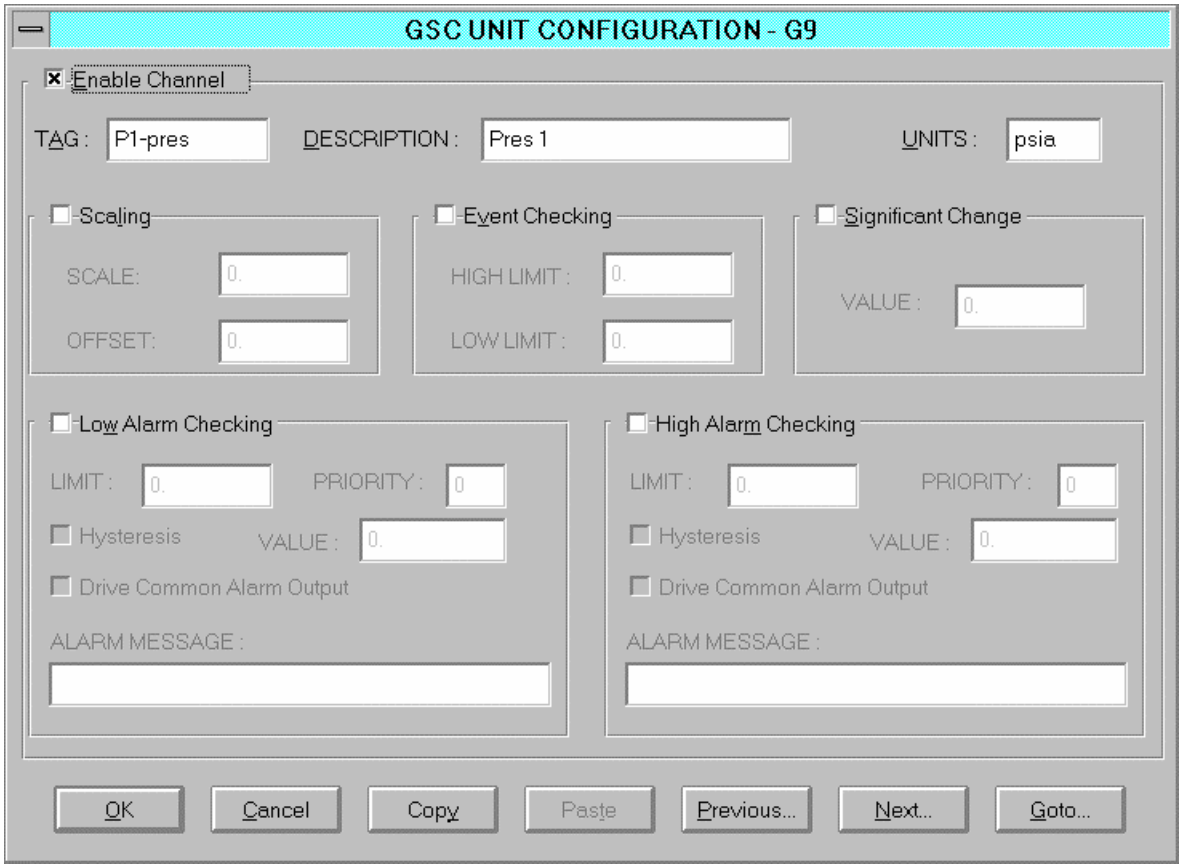
The values read from the input stream are displayed at the right hand side of the box *Allocate Input Stream to Channels*. A scroll bar appears in this box if the number of values is larger than can be displayed.

To map a value in the ASCII input stream to an Orchestrator channel, ensure that the appropriate checkbox is ticked, and enter the Orchestrator channel number. The program checks that the same channel is not mapped to more than one input value.

Note that the configuration can be changed without scanning the ASCII input stream. This could be done if changes were required while Orchestrator was enabled and scanning the input stream, or if the configuration was being set up on a system that did not have the input stream connected.

Channel Configuration

Double clicking on a channel on the channel summary list calls up a menu to permit configuration of the tags, descriptions, etc. of the down hole device channels.




All the fields on this menu are standard Orchestrator channel fields.

The *Cancel* button discards any changes made on this menu. However, the *OK* button does not commit any changes made to disk until the *OK* button or the *Reconfigure* button on the device configuration menu (see section 5.7.1 above) is clicked.

Data Formats

The format of data sent by a GSC device is as follows:

Eight numbers, each of 10 digits with leading or trailing spaces as required, the first number being the pressure frequency reported by gauge 1, the second being the temperature frequency of gauge 1, and so on for the other gauges. The string is terminated by a line feed followed by a carriage return. If fewer than four gauges are connected, the GSC device still sends eight numbers.

The format of numbers from an ASCII input device is as follows:

Any number preceded by anything other than the beginning of a line, the end of a line (carriage return or line feed), a space or a TAB character is discarded. No error is generated to indicate that numbers have been discarded in this way. Valid numbers are extracted in the order in which they are contained in the message from the ASCII device, and put into channels as controlled by the mapping defined.

This format has been used to ignore any date or time stamp in a message from an ASCII input device, while coping with messages that are not stamped in any way. The system should be able to cope with any string of numbers, separated by either spaces or TAB characters, and terminated with one or more carriage return or line feed characters.

For GSC operations, the system also requires SCBOX.PRG configuration program, referred to as GSC_PROG.TXT.

This file must be resident in ***[drive]:\EdgeX***.

GSC / SRO Requirements:

EXAL GSC (Controller box).

EPG, Quartz dyne (or suitable alternative) and CCL (Passive type) gauge assembly

PC disc with gauge calibrations

Suitable depth encoder and cable reel/connectors as appropriate

Chart recorder as appropriate

BNC to 2*4mm connector for chart recorder

Additional ScadaPro Configuration:

Access PROCESSORS ⇒ CALCULATOR ⇒ CHANNELS

Ensure C53 is enabled as depth with calculation = G15 * 0.3048

Ensure C56 is enabled as line speed with calculation = FABS (G16-H120)

Access PROCESSORS ⇒ HISTORY CHANNELS

Ensure H91-120 is set up to calculate line speed using G15 & G16 with averaging disabled.

Access DEVICES ⇒ GSC

Ensure G1 - G16 are enabled to recover and process the data in real time.

**ALSO**

Access PROCESSORS ⇒ RT ⇒ HIST CALCS

Ensure RH 81 - 88 are enabled.

**Although they are duplicates of G channels they are required if any historical re-calculations are required.**

Access LOGGERS ⇒ LOGGER_NAME ⇒ CHANNELS

***Reminder*** If down hole data is required to be trended/reported simultaneously with any surface data logged in top level logger, then RH 81 - 88 will also have to be logged to the top level logger.

CCL Chart / Recorder

Connect the gauge line to the chart recorder via the 4mm plug x-over.

Ensure the 100ohm resistor is in line.

Ensure the rear switch for encoder pulses is set to 60 OR 600 as appropriate.

The toggle switch with Up & Down chevrons marked will reverse whatever rotational direction the chart paper moves.

Set speed of chart to 60cm/minute.

(This implies 2 feet per square movement on current default chart paper.)

(Check Paper type with base technician)

Manually set pen to middle of trace on left-hand part of paper.

On CCL movement and data generated, then ideally the deflection for non-tubing identifiers (e.g. pup joints, packer, perforations, etc.) should be +/- ½"

Adjust the gain control to maintain a realistic deflection.

During real time monitoring of the CCL operations, a preliminary survey of a specific section of the completion string will be undertaken to verify the CCL depth to counteract for any mechanical deficiencies inherent in Wireline winches.

The relevant depth adjustment can be inputted into the designated field within

ORCHESTRATOR ⇒ DEVICES ⇒ GSC ⇒ CONFIGURE

On re-configuring system, the depth display will update and users should be aware and remember the adjustment while relating to Wire line personnel during the CCL running period.

Cabling

**Standard PC Systems**

Connect EDGE port to PC (9 way) COM port with

'NTED-PC-ASCII'.

**Stress wave Sand Systems**

Connect EDGE port to Stress wave 25 way module with

'NTED-SM-SW'.

**GSC System**

NTED-SRO-CB lead between EDGE and GSC box (On GSC Box with DIN Computer Connector).

NTED-SRO-CB1 lead between EDGE and GSC box (On later GSC version boxes with standard 9 way computer connector)

BNC to suitable 4mm connectors for SRO gauge.

## 5.8 UNITS CONFIGURE

Units Support

Facilities have been added to the system to allow values calculated by the real-time / historic calculator to be displayed in units selected by the end user. For instance, although the real-time / historic calculator handles oil Flowrates internally in barrels per day, the user can select to see all oil Flowrates in cubic metres per second.

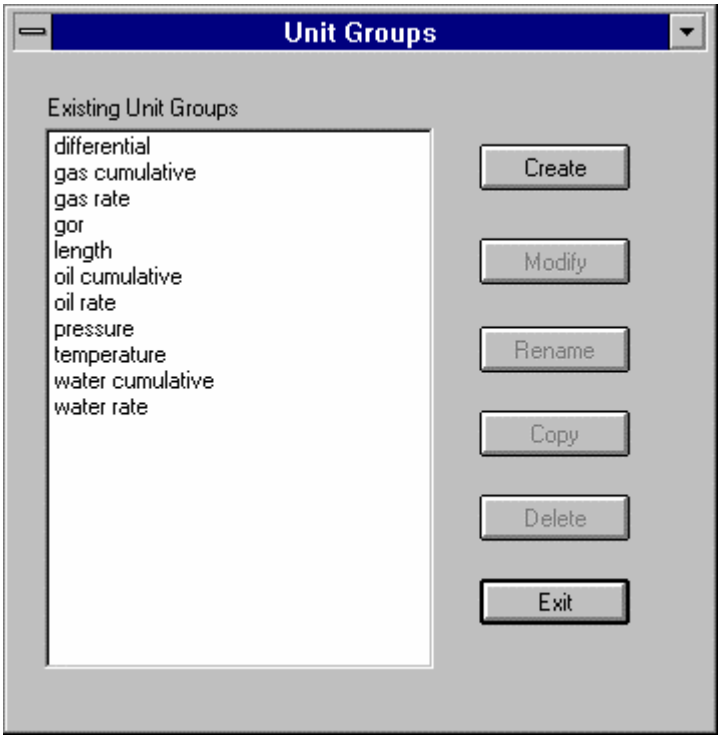
The concept of a *units group* has been defined. All real-time / historic calculator channels can belong to a units group. A units group is used to group together all the channels measured using the same units, for instance temperature or oil Flowrates. The user selects the specific units in which all the channels in a 'Units Group' are displayed. For instance, the available units for the temperature units group might be Celsius, Fahrenheit, Kelvin and Rankin.

There are three steps to configuring units support:

1. configuring the units groups, and the specific units available in each group
2. configuring the units group to which each real-time / historic calculator channel belongs
3. selecting the specific units for each units group

Configuring Units Groups

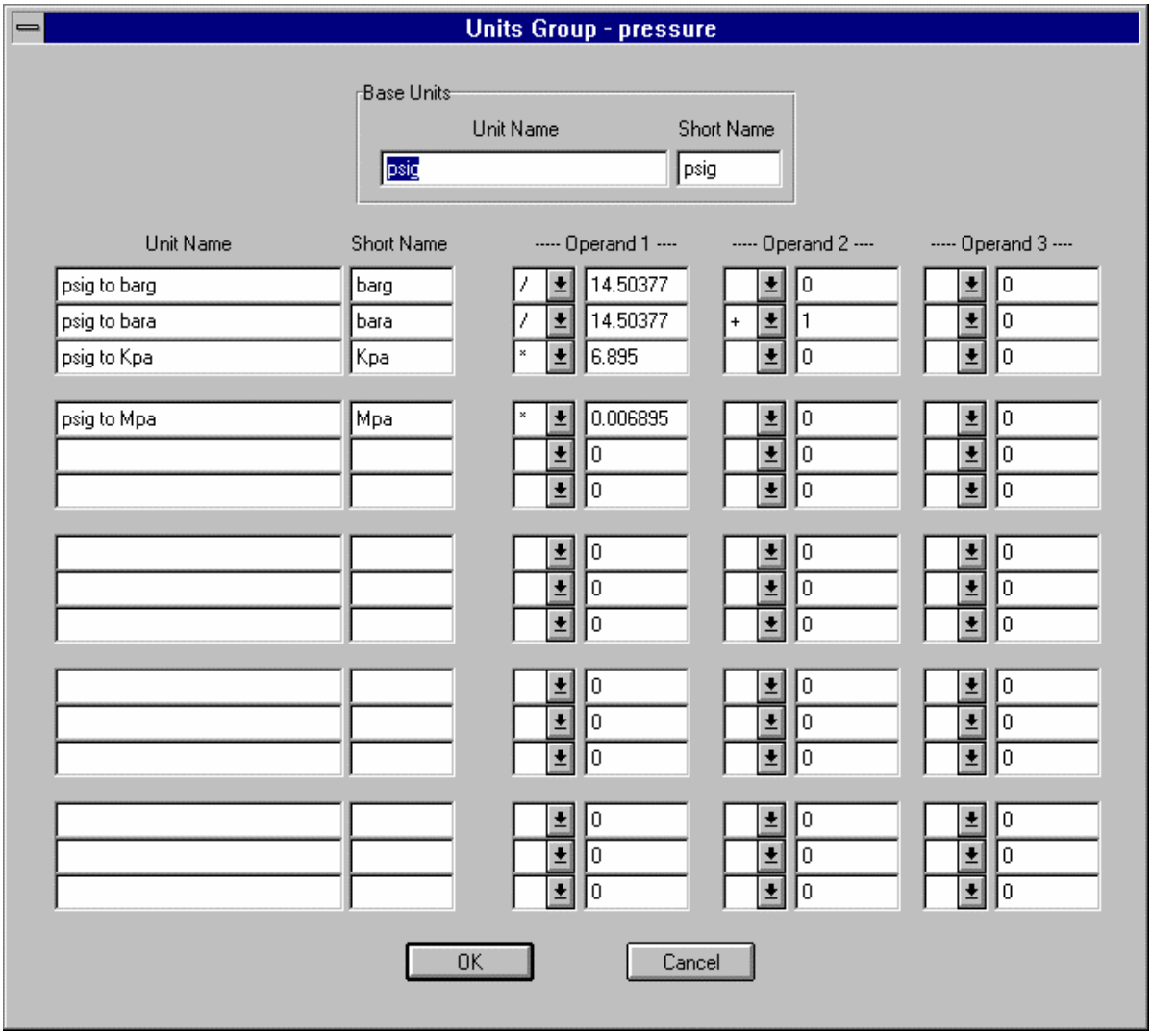
When the Configure Units Groups program is started, a list of all the units groups that have already been configured is displayed, as illustrated below:




The maximum length of the name of a units group is 16 characters. However, there is no limit on the number of units groups that may be configured.

Buttons are available to *Create* a new units group from scratch, to *Modify* an existing units group, to *Rename* an existing units group, to create a new units group by *Copy*ing an existing units group, or to *Delete* an existing units group. The *Modify*, *Rename*, *Copy* and *Delete* buttons are enabled on when an existing units group has been selected by clicking on the desired units group. Double clicking on a units group has the same effect as selecting it and then clicking the *Modify* button.

The detail of a unit group are displayed after either the *Create* button or the *Modify* button has been clicked, as illustrated below:




Each units group has *Base Units*. These are the units in which the real-time / historic calculator works internally. Up to 15 other units can be defined for the units group. The configuration of these extra units includes details of how to convert from the base units to the other units. For instance, from the above menu, to convert from psig (the base units) to barg requires dividing the psig value by 14.50377.

Each specific unit, including the base units, is identified by a unit name and a short name. The short name is up to 4 characters, and is used as the Orchestrator channel units when that unit is selected. The unit name is longer (up to 16 characters) and is used to identify the units, and appears when the user selects the specific units for use (see section below for details).

The formula to convert from base units to other units can have up to 3 terms, and is executed in strict left to right order, with no operator precedence.

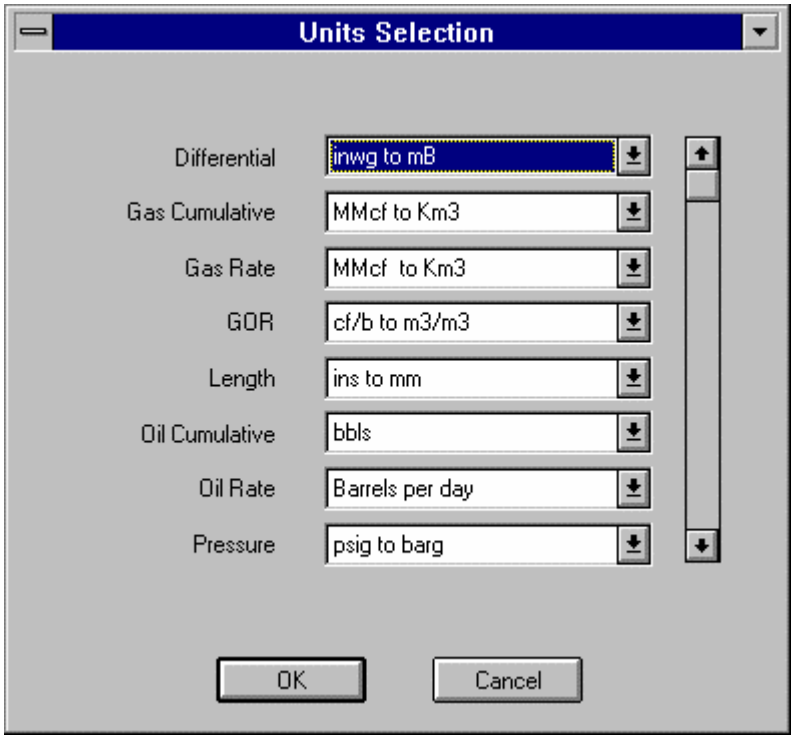
Configuring Real Time / Historic Channels

Once all the units groups have been configured, the real-time / historic channels can be assigned to one of the units groups. This is done using the menu displayed in section 5.5.2 which displays a list of all the configured units groups, plus an extra entry, *None*, to allow for real-time / historic calculator channels that do not belong to any units group.

Selecting Units

Units should only be selected before logging starts, as the system may not be able to perform recalculations if the selected units are changed. It is further recommended that the selected units are changed only when Orchestrator is disabled. If the units are changed while Orchestrator is running, the real-time / historic calculator will have to be reconfigured to pick up the changes in the units.

When the program to select units is started, the following menu appears:




This menu displays the currently selected units for each units group. A scroll bar is available if there are more units groups than can be displayed on the menu. Beside the currently selected units for each units group is a drop down arrow. Clicking on these, displays a list of all the available units that have been configured for the corresponding units group.

When the changes made using this menu are saved (by clicking the OK button), the configuration of all the channels in the real-time / historic calculator is updated to set their units to be the short name for the selected units. Only channels that are in a units group have their units changed. If a channel has been configured to belong to no units group, its units are unchanged.

Additional 'Units' Information

RH channels inputs use imperial derived values for all source codes by default.

This implies the following internal sequence:

- Execute oil, gas, etc calculations with imperial units.
- Execute 'units' processor conversion.
- Output user generated units to displays, monitors, etc.

From previous explanation on units, it can be seen that users apply a single line conversion across single channels.

See GOR rates in later section for further explanation.

## 5.9 FLOW RATE CALCULATION/DESCRIPTIONS

### 5.9.1 Oil/Water Hook-up

**General info on Oil & $H_2O$ Meters**

Oil and Water have facility by default to sum up to 3 meters per separator stage.

(Additional can be configured)

Both oil and water calculation raw inputs are via the (RH) Real Time/Historic channels.

Therefore (RH) meter inputs should be either a (DS) allocation or a zero value.

I.e. Assume Separator 1 oil calculation inputs = RH17, RH18, RH19 (System defaults)

Separator 1 $H_2O$ calculation inputs = RH20, RH21, RH22 (System defaults)

And the user wishes to allocate 2 x Oil : DS17 & DS18 to be summed

2 x $H_2O$ : DS19 & DS20 to be summed.

The (RH) processor MUST be configured:-

| | Tag | Input |
|---|---|---|
| RH17 | M1/1iOil | DS17 |
| RH18 | M2/1iOil | DS18 |
| RH19 | N/A | 0 |
| RH20 | M1/1iw | DS19 |
| RH21 | M2/1iw | DS20 |
| RH22 | N/A | 0 |

(Tags are any user-configured text).

Note on this example that both the oil and water allocations can have zero inputs.

References to meters in various sections, e.g. RH descriptions, are generally referred to as: -

Oil Meter 1

Oil Meter 2

Oil Meter 3

And

$H_2O$ Meter 1

$H_2O$ Meter 2

$H_2O$ Meter 3

Per separator stages and summarised as

E.g. M2/1iOil = Meter2, Sep1 oil inst. rate

M1/2iw = Meter1, Sep2 $H_2O$ inst. rate.

### 5.9.2 Calculation Descriptions

This section provides a summary of system calculations. The following calculations are covered:

- Separator Rates
- Stock Tank Rates
- Gas Rates
- Water Rates
- GORs

Flow chart diagrams are also included in this section to highlight the important inputs/outputs and assist users in understanding of each calculation.

Each box type logic module contains 3 sets of assignments (i.e. RH, MI, etc.). As the current system supports 3 separator possibilities, the 3 sets of assignments refer to separator 1, 2, 3 respectively.

The important/normal calculated outputs that users should monitor and report are shaded in for clarity.

The complete text listings in tabular form of all assignments are included at the end of this complete section.

### 5.9.3 Separator Rates

The general form of separator rates is:

$$Q_{oSep} = V_{Sep} \times Mf \times \frac{\left(\frac{BSW_{sep}}{100}\right)}{\frac{14440}{\Delta t}}$$

| | |
|---|---|
| $Q_{oSep}$ = | *Gross Oil Rate. (per day)* |
| $V_{Sep}$ = | Gross oil Volume measured by meter under separator conditions. |
| $BSW_{sep}$ = | Basic Sediments and Water corrected to separator conditions. (%) |
| Mf = | Meter correction factor without temperature compensation. |
| $\Delta t$ = | Time between two readings. |

### 5.9.4 Stock Tank Rates

The general form of stock tank rates (often referred to as standard rates) is:

$$Q_{oStk} = V_{Sep} \times Mf \times \left(1 - \frac{(BSW_{measured})}{100}\right) \times \left(1 - \frac{Shr_{oil}}{100}\right) \times VCF \times \frac{1440}{\Delta t}$$

$Q_{oStk}$ = Net Oil Rate at 60 degF and atmospheric pressure.(per day)

$V_{Sep}$ = Gross oil Volume measured by meter under separator conditions.

VCF = Volume correction factor to be applied between either the tank temperature or final shrinkage temperature and 60 degF. (Set to 1 if Katz method is used)

$BSW_{measured}$ = Basic Sediments and Water. (%)

$Shr_{oil}$ = $Shr_{oil}$ is shrinkage corrected for water and gas and is quoted at observed temperatures. The VCF calculation corrects the oil rates to required temperature standard conditions.

(I.e. $Shr_{60}$ (%) = 100 – [((1 – $Shr_{oil}$ /100) * VCF) * 100]

Mf = Meter correction factor without temperature compensation.

$\Delta t$ = Time between two readings.

### 5.9.5 Gas Rates

The general form of gas rates is:

$$Qg = C' \sqrt{} hw \times Pf$$

**Equation 3-D-1 AGA 3)**

Where,

Qg = Gas Rate (scf/hr)
C' = Orifice Flow Constant
Hw = Differential flow in inches of water
Pf = Flowing pressure in psia.

**C' (Orifice Flow Constant)** is further broken down to: -

$$\mathbf{C' = F_b * F_r * Y * F_{pb} * F_{tb} * F_{tf} * F_{gr} * F_{pv}} \quad \textbf{(3-D-2)}$$

Where,

$F_b$ = Basic Orifice Factor
$F_r$ = Reynolds Number Factor
Y = Expansion Factor
$F_{pb}$ = Pressure Base Factor
$F_{tb}$ = Temperature Base Factor
$F_{tf}$ = Flowing Temperature Factor
$F_{gr}$ = Specific Gravity Factor
$F_{pv}$ = Super compressibility Factor

### 5.9.6 GOR Concepts

By default, all system calculations are internally calculated in imperial format.

Where Oil & Water = Barrels

Gas = MMcf (Millions cubic feet)

3 Types of conversions are currently supported.

1. **GOR**
2. **CGR**
3. **LGR**

Where 1. **GOR** Gas-Oil Ratio

Typically

$$Gas(cf) \big/ Oil(bbls)$$

2. **CGR** Condensate-Gas Ratio (Sometimes just referred to as OGR)

Typically

$$Condensate(Bbls) \big/ Gas(MMcf) \quad \text{or} \quad Condensate(m3) \big/ Gas(Km3)$$

3. **LGR** Liquid-Gas Ratio

Same as CGR, but water rate is included in Condensate

Each of the 3 types has metric conversions available within the '*Units Select' processor*. This must be allocated prior to start of test. In addition, there are manual inputs to control conversion of

| | | | |
|---|---|---|---|
| (a) | Gas | Cubic feet to MMcf | (MM implies 000,000's) |
| (b) | Oil | Barrels in Units, **K**units, **M**units | (**K** implies 000's. **M** implies 000,000's) |

A little thought is required if user wishes to use 2 inputs, which require conversions each. E.g. GOR's

E.g. Assume Gas Rate = 2MMscf/d

Oil Rate = 5000 Bbls/d ∴ GOR (imperial) = $2e6 \big/ 5000$ = **400**

Convert rates to $m^3$

Gas Rate = 2e6 * 0.028317 = 56634 $m^3$

Oil Rate = 5000 * 0.158976 = 794.9 $m^3$ ∴ GOR (metric) = $56634 \big/ 764.9$ = **71**

A single line conversion in the 'Units Configure' would have the numerator conversion as the first operand and the denominator conversion as the second operand.

***For association, the denominator must reverse from multiplication to division and vice versa.***

I.e. For this example, the conversion line in 'Units Configure' would be

| | | Operand1 | Operand2 | |
|---|---|---|---|---|
| Internal GOR | (**400**) | **multiply by** 0.028317 | **divide by** 0.1589876 | = **71** |

### 5.9.7 Manual Tank Configure

There are some test situations where it may be impractical to flow through separator stages and liquid flow is measured from stock tank levels.

A simple manual user interface allows operators to enter delta change in levels over a period of time in order to provide basic uncorrected stock tank rate outputs.

The following should be observed:-

Manual tank readings are initiated from on/off toggle in *Manual Tank* option in *Manual Inputs.*

In this mode, all other oil rate calculations are switched off and will return errors on system channels.
3 input channels are *Delta Level*, *Time Period/Change in Minutes* and any *Cumulative Start* value.

It is strongly recommended that user inputs a manual input record coinciding with the difference in time value for the *Time Period/Change in Minutes* input data.

Readings are only valid within current logged data records.

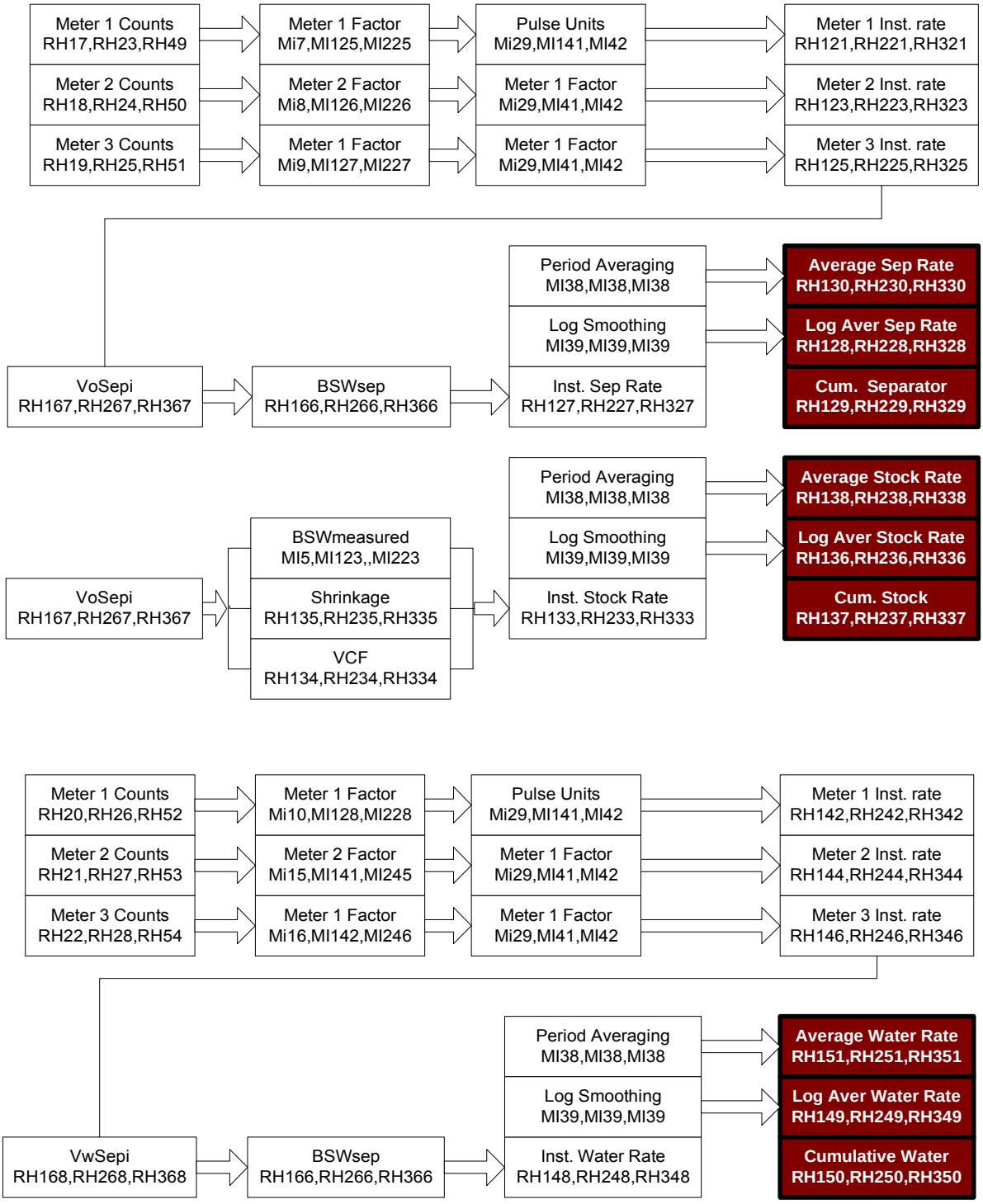
Output readings are *Oil rate Average* and *Oil Rate Cumulative*. Both these channels use same identifiers, as per standard Stage 1 Stock tank therefore user does not have to set up auxiliary channels.

There is currently no configuration to calculate volumes of differing viscosities.

### 5.9.8 Example Oil/Gas Flow Charts

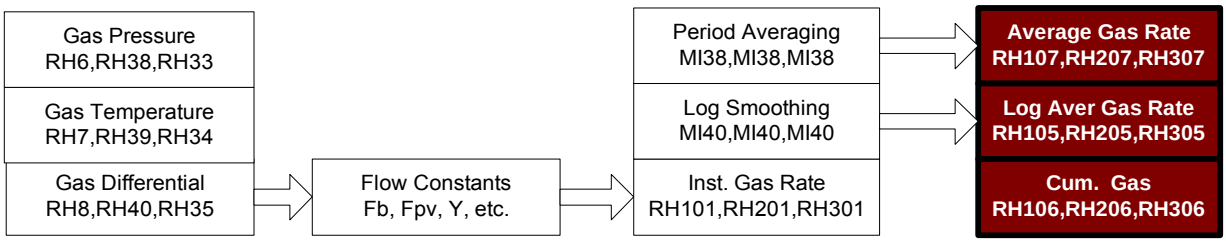
## Oil & Water Rates

**(3 Sets of assignments per Stage 1, 2 & 3 respectively)**



## Gas Rates

**(3 Sets of assignments per Stage 1, 2 & 3 respectively)**



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# 6. ASCII DISK & WITS INTERFACES

## 6.1 ASCII DISK INPUT

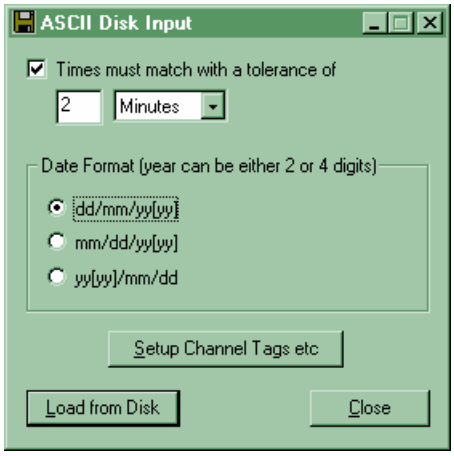
The ASCII disk input utility allows time stamped third party data to be loaded into the system and merged with logged data recorded by Orchestrator. The following are the key points for the format of this file:

- a single line contains date, time and a series of values
- lines are terminated by one or more carriage returns and/or line feeds
- lines that start with non numeric data are ignored
- three date formats are supported, dd/mm/yy, mm/dd/yy and yy/mm/dd
- years may be either two digit (e.g. 98 for 1998, 00 for 2000) or four digits (e.g. 2001)
- time is expressed as hh:mm:ss, and follow the date. The range of hh is 0 to 23
- any non-numeric character is accepted as a valid terminator for a date/time field
- values must be separated by one or more commas, Tabs or spaces
- data in the file must be in chronological order
- the first value on a line after the date and time is used to update the first ASCII disk channel logged, and so on for subsequent values on a line

A prerequisite for merging ASCII data is that the Orchestrator loggers must already be logging the ASCII disk channels. Initially, the values in the Logfile will be in error, and will only be updated with values when an ASCII disk file is read into the system.

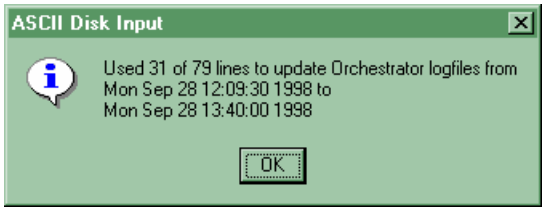
When an ASCII disk file is loaded into the system, each line of the file can update zero or more Orchestrator Logfile scans. For instance, if the ASCII disk file has data at ten second intervals, and the Orchestrator Logfile has data at one minute intervals, then only one in every six lines in the ASCII file will be used to update and Orchestrator scan. Assuming that both the Logfile and the ASCII disk have data at even time boundaries, then an Orchestrator Logfile scan may have data that is up to four minutes out of date. There is an option to restrict the maximum age of data in the Orchestrator Logfile. If there is no data in an ASCII file more recent than this time, then the Orchestrator Logfile scan will have the ASCII disk channels set into error.

To load an ASCII disk file, run the *ASCII Disk Load* program from the EdgeX program group. The following dialog is displayed:

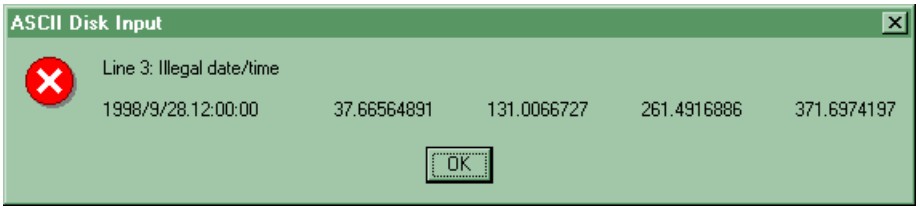



The *Times must match with a tolerance of* checkbox allows the user to limit the maximum age of ASCII data merged into the log files. If this option is not ticked, then the value and drop down fields immediately below are disabled.

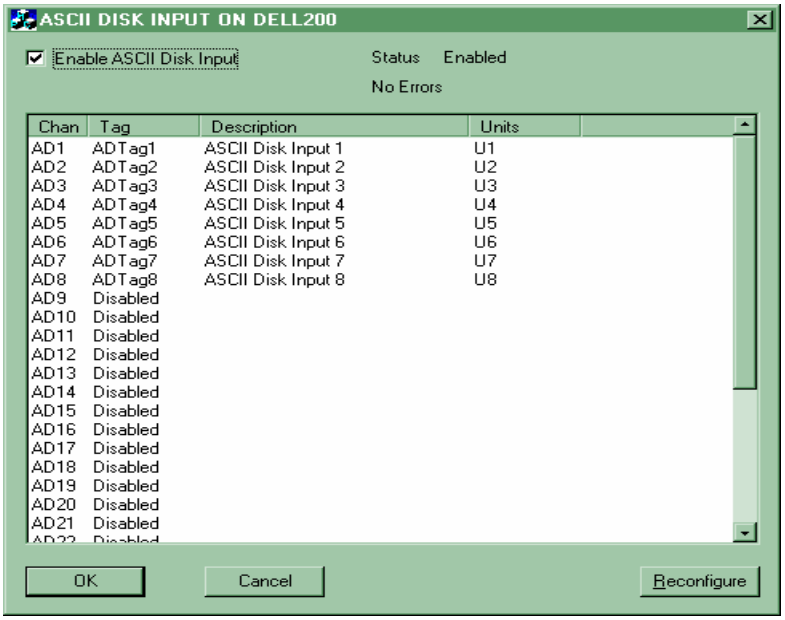
When the *Load from Disk* button is clicked, a standard Windows File Open style dialog is displayed to allow the ASCII disk file to be selected. This starts off in the directory from which a file was last loaded. When a file is selected, it is loaded into the system and merged with the Orchestrator logged data. If the file is merged successfully, a summary of the load process is displayed, as illustrated below:



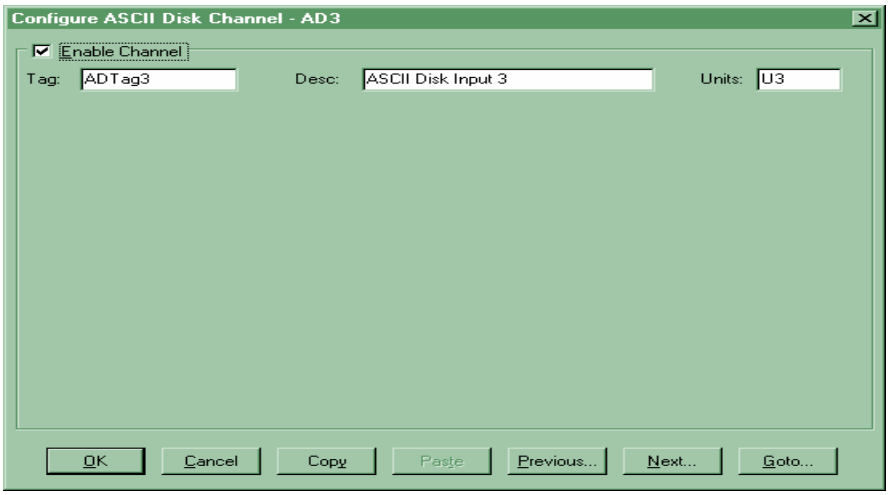
This indicates how many of the lines in the ASCII file were used to update Orchestrator Logfile scans. The number of lines used is less than the number of lines in the file, if there are comment lines in the file, or if the frequency of lines in the file is larger than the frequency at which the Orchestrator logger logged data. A recalculation is flagged from the date and time of the earliest Logfile update, so that the updated log files will be copied across to any client systems that are running the client logging software.
If an error is detected in the file, the line that caused the error is displayed, as illustrated below:




Clicking the button *Set-up Channel Tags etc* calls up a configuration dialog allowing the tags, descriptions and units of the ASCII disk channels to be specified:




This screen shows a summary of the ASCII disk input channels. To configure a channel, double click on it to display the following dialog:




If changes are made to the configuration of a channel, click the *Reconfigure* button on the configuration summary dialog. When an ASCII disk file is loaded, the Orchestrator Logfile will be updated with the latest configuration information for the ASCII disk channels.

The following error messages can be reported. Note that these include errors that are not related to the ASCII file, such errors do not therefore include ASCII line details.

| | |
|---|---|
| Can't link to ASCII disk processor | The ASCII disk processor has not been started, so there are no ASCII channels in the system. No data can be merged until this processor is started. |
| Can't open <filename><br><error code : error description> | The selected ASCII disk file could not be opened. A system error code and description are given. |
| Can't find Orchestrator logger 1 | Orchestrator has not been loaded. |
| No Orchestrator Log files | There are no log files that can be updated. |
| Memory allocation failure | The program requires more memory than can be allocated. |
| No Orchestrator Log files match time range of selected file | The range of times in the selected ASCII disk file does not overlap with the range of times of logged data |
| All Orchestrator Log files updated before end of file reached | The ASCII disk file contains more recent data than any Logfile. This is just a warning, not a fatal error. |
| Can't open Logfile <filename><br><error code : error description> | The specified Logfile cannot be opened. A system error code and description are given. |
| Can't read header of Logfile <filename><br><error code : error description> | The Logfile header cannot be read, most probably because the Logfile is corrupt |
| Bad header in Logfile <filename> | The Logfile header is corrupt, most probably because the Logfile itself is corrupt |
| Can't allocate scan memory for Logfile <filename><br><error code : error description> | The program requires more memory to update the specified Logfile than can be allocated. |
| Logfile <filename> has no ASCII Disk Channels – skipping | The specified Logfile does not contain any ASCII disk channels, and so cannot be updated. This is just a warning, not a fatal error. |
| Date/time out of order | The ASCII disk file contain lines that are not in chronological order |
| No date/time on line | A line in the ASCII disk file does not contain a recognisable date and/or time |
| Non-numeric data in date/time | A line in the ASCII disk file does contains non-numeric data when the system was expecting a date/time field |
| Illegal date/time | A line in the ASCII disk file does an illegal date, eg 30th February |
| Non-numeric value | A line in the ASCII disk file does contains non-numeric data when the system was expecting a value |

| | |
|---|---|
| Logfile <filename> has <nn> ASCII Channels, disk file has <mm> Values | The Logfile to be updated has only nn ASCII disk channels, but at least one line read from the disk file has more channels than that. This is just a warning, not a fatal error. |

## 6.2 WITS SYSTEM

### General

The Well site Information Transfer Specification (WITS) is a communications format used for the transfer of a wide variety of Well site data from one computer system to another. The Edge system has implemented a limited subset of the WITS protocol, allowing the exchange of the predefined record numbers 1 and 18 using WITS level 0 protocol. WITS level 0 protocol is a uni-directional protocol, in other words one serial link can either send information or receive information, but it cannot do both. Two serial links will therefore be required if the Edge system is to act as both a sender and a receiver.

Separate programs have been developed to send and to receive, and these have been implemented as Orchestrator scanners. Therefore, subject to the limitation of the available serial ports, an Edge system can be configured to have as many senders and as many receivers as desired. Furthermore, the number of senders and the number of receivers are completely independent – for instance, a system can have one of each, or three receivers and no senders.

### 6.2.1 WITS RECEIVER

The WITS receiver is hard coded to recognise only WITS record 1 and 18. Each incarnation of the WITS receiver registers its own channels. WITS record 1 has 45 values defined, these are mapped to channels 1-45. WITS record 18 has 31 channels defined; these are mapped to channels 46-76.

Some values are character based, such as the DST Identification (item 8 of record 18). The values of channels corresponding to these records will contain the result of converting the character string to a floating point value; if the character string is not the text representation of a floating point number, the value will be zero.

The WITS protocol allows:

- individual items in a record not to be sent
- individual items to be sent as nulls (value -9999)
- individual items to be sent indicating invalid data (value -8888)

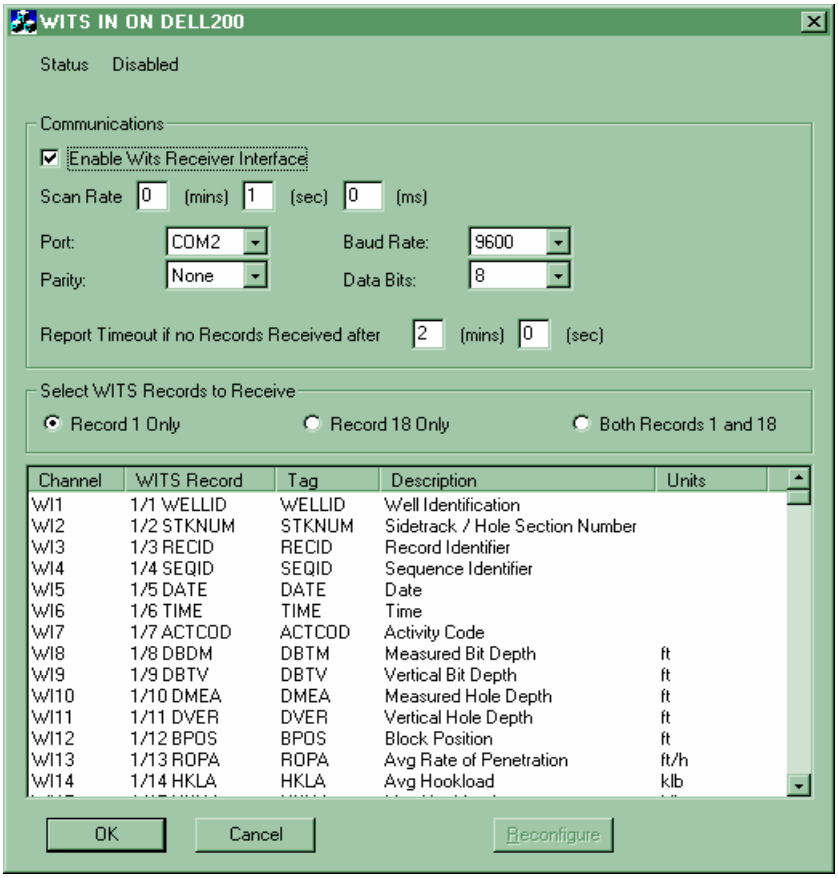
If the WITS receiver receives a record that does not contain all the items, or one that has an item value of -8888 or -9999, then the corresponding channels are put into error.

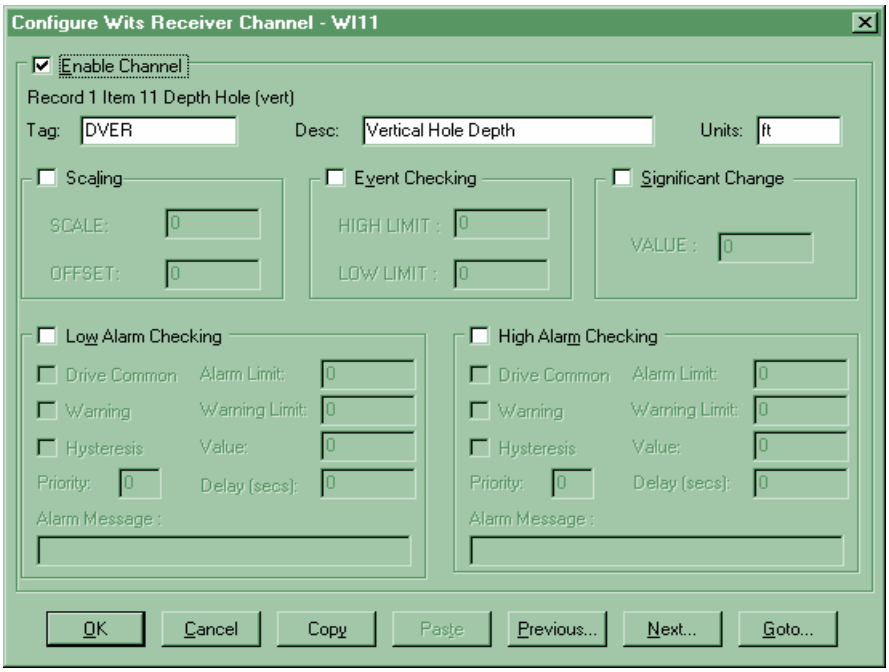
All values corresponding to a record are put into error if that record is not received for more than a specified time interval.

Configuration of the WITS receiver has two parts:

- configuration of communications parameters
- configuration of the WITS records to receive
- configuration of channels to hold values received

The screens to configure the WITS receiver are shown below:




The first screen allows configuration of the communication parameters, including the timeout interval, and the WITS records expected. If the remote sender is sending record 1 but not record 18 but not both, the receiver should be configured to receive record 1 only. This avoids the interface reporting a timeout error receiving record 18. Similarly, if the remote sender only transmits record 18, the receiver should be configured to receive only that record.

The first screen also has a summary of the channel configuration. This summary includes a short description of the WITS record that is used to determine the channel values, for instance *1/11 DVER* for channel 11 above. This indicates that the channel corresponds to item 11 of WITS record 1, which has a short name *DVER*.

The second screen, to configure the channel is a standard Orchestrator channel configuration screen. The only non-standard item is the channel description, just below the *Enable Channel* checkbox. This has a longer description of the WITS item corresponding to the channel.

The short and long descriptions are configured using an INI file called WITS.INI, which can be found in the \ Orchestrator\Current_Config directory. An example of part of this file is:

```
[Record 1]
.
.
ChanDesc8=Record 1 Item 8 Depth Bit (meas)
ChanDesc9=Record 1 Item 9 Depth Bit (vert)
ChanDesc10=Record 1 Item 10 Depth Hole (meas)
ChanDesc11=Record 1 Item 11 Depth Hole (vert)
.
.
ChanShortDesc8=1/8 DBDM
ChanShortDesc9=1/9 DBTV
ChanShortDesc10=1/10 DMEA
ChanShortDesc11=1/11 DVER
.
.

[Record 18]
.
.
ChanDesc8=18/8 DST Identification
ChanDesc9=18/9 DST Intvl Top Depth (meas)
ChanDesc10=18/10 DST Intvl Top Depth (vert)
ChanDesc11=18/11 DST Intvl Bott Depth (meas)
.
.
ChanShortDesc8=18/8 DSID
ChanShortDesc9=18/9 DDTM
ChanShortDesc10=18/10 DDTV
ChanShortDesc11=18/11 DDBM
.
.
```

The WITS receiver can report the following errors:

| | |
|---|---|
| Timeout on record *n* | The specified record has not been received within the timeout period |
| No !! for record *n* | WITS records are terminated with the sequence !!; this error indicates that no such terminator was received for the specified record |
| Bad item *m* for record *n* | An invalid item number has received for the specified record |

If errors occur on both records 1 and 18, then these errors are displayed alternately. If more than one error occurs for a record, only the most recent error is reported.

### 6.2.2 WITS SENDER

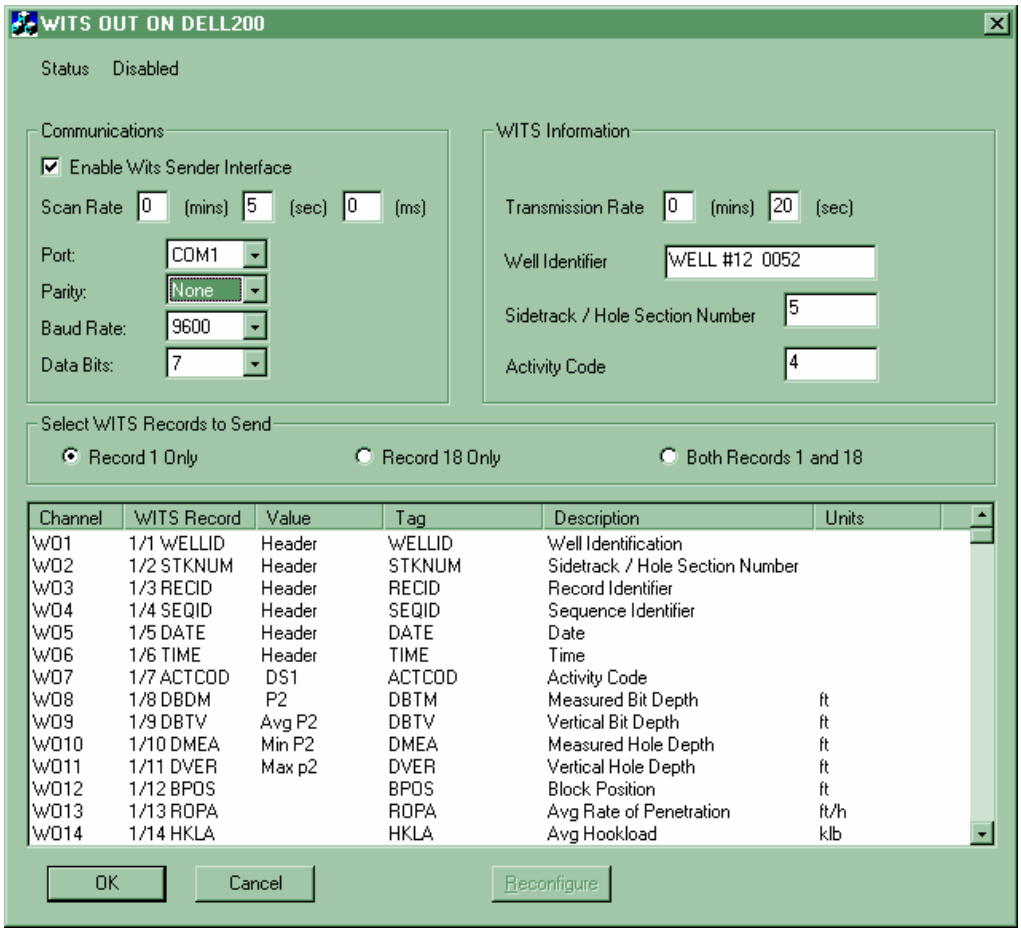
Like the WITS receiver, the WITS sender maps items in records 1 and 18 to channels registered by the WITS sender scanner. The same mapping is used, i.e. channels 1 to 45 are for record 1, and channels 46 to 76 are for record 18.

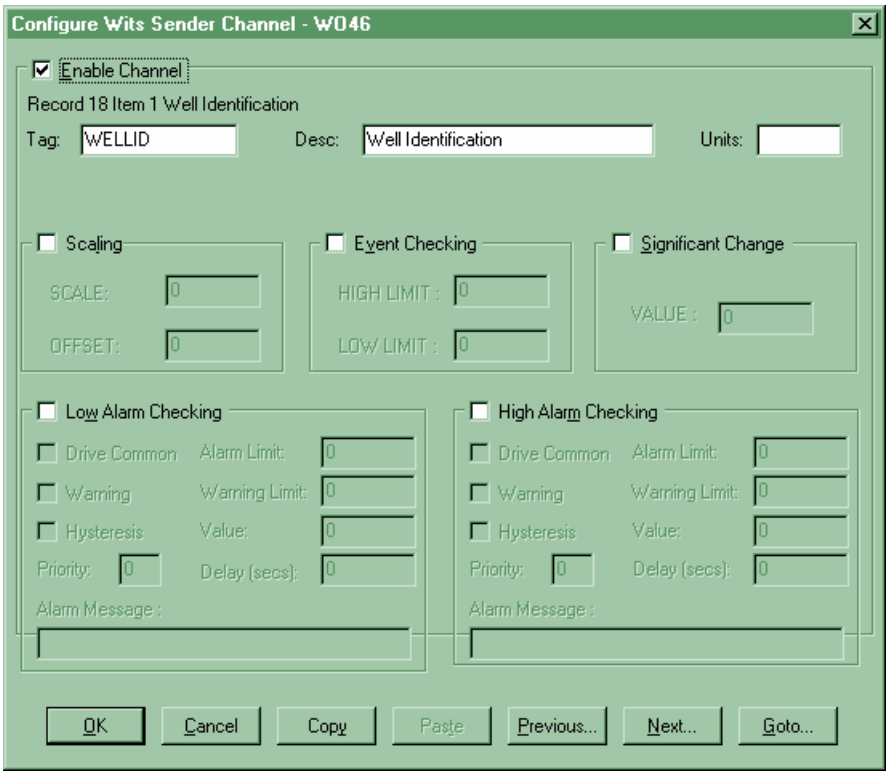
However, the source of these channels is typically the value in other channels on the Orchestrator system, thus allowing, for example, channel RH104 to be mapped to item 21 of record 18.

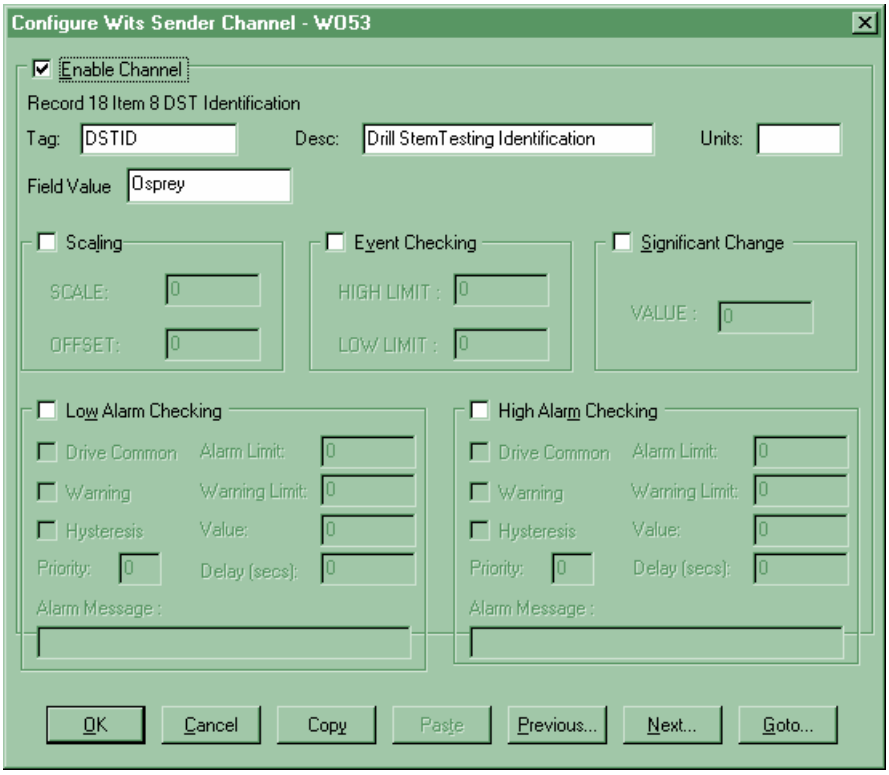
Configuration of the WITS sender has three parts:

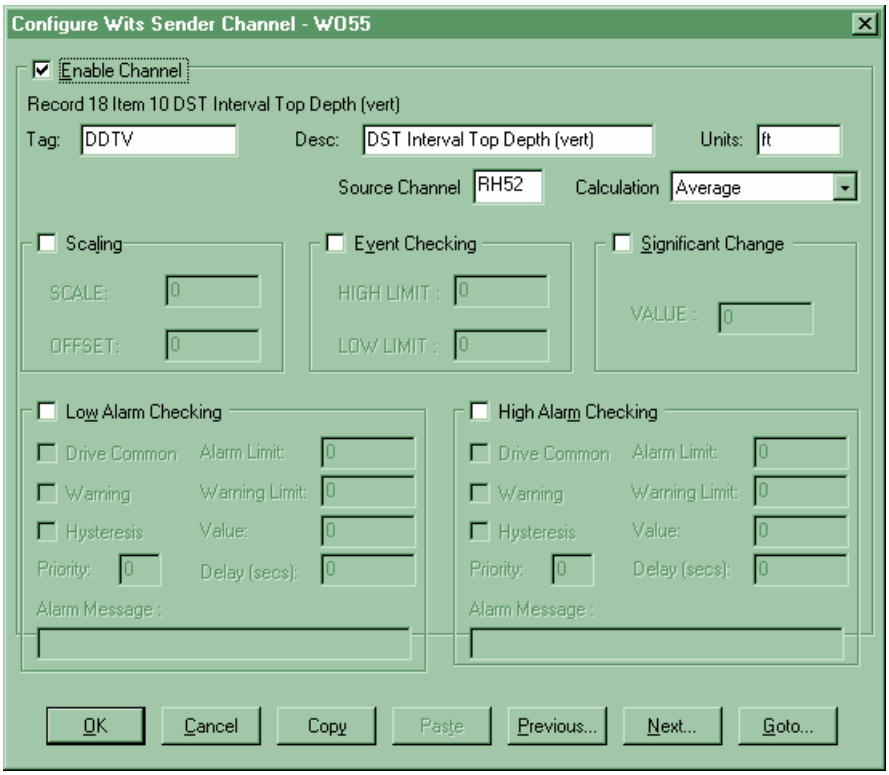
- configuration of communications parameters
- configuration of the WITS record header
- configuration of the WITS records to transmit
- configuration of channels to hold values sent

The screens to configure the WITS sender are shown below:




Configure Wits Sender Channel - WO46
Enable Channel
Record 18 Item 1 Well Identification
Tag: WELLID
Desc: Well Identification
Units:
Scaling
SCALE: 0
OFFSET: 0
Event Checking
HIGH LIMIT : 0
LOW LIMIT : 0
Significant Change
VALUE : 0
Low Alarm Checking
Drive Common
Warning
Hysteresis
Priority: 0
Alarm Limit: 0
Warning Limit: 0
Value: 0
Delay (secs): 0
Alarm Message :
High Alarm Checking
Drive Common
Warning
Hysteresis
Priority: 0
Alarm Limit: 0
Warning Limit: 0
Value: 0
Delay (secs): 0
Alarm Message :
OK
Cancel
Copy
Paste
Previous...
Next...
Goto...


Configure Wits Sender Channel - WO53
Enable Channel
Record 18 Item 8 DST Identification
Tag: DSTID
Desc: Drill StemTesting Identification
Units:
Field Value Osprey
Scaling
SCALE: 0
OFFSET: 0
Event Checking
HIGH LIMIT : 0
LOW LIMIT : 0
Significant Change
VALUE : 0
Low Alarm Checking
Drive Common
Warning
Hysteresis
Priority: 0
Alarm Limit: 0
Warning Limit: 0
Value: 0
Delay (secs): 0
Alarm Message :
High Alarm Checking
Drive Common
Warning
Hysteresis
Priority: 0
Alarm Limit: 0
Warning Limit: 0
Value: 0
Delay (secs): 0
Alarm Message :
OK
Cancel
Copy
Paste
Previous...
Next...
Goto...




Configuration of communications parameters is the same as for the WITS receiver.

There are seven items in a WITS record header, these are:

1. Well Identifier. A text string of up to 16 characters, the WITS sender uses the value typed in on the first of the screens above.
2. Side-track / hole section number. A short (16 bit) integer, the WITS sender uses the value typed in on the first of the screens above. However, if the Orchestrator channel corresponding to this item is enabled and a source channel is configured, the value in this channel will be used instead; however, if this channel is in error, the typed in value will be used instead.
3. Record identifier. Either 1 or 18, depending on the record being send.
4. Sequence Identifier. An incrementing number for each record. The sequence identifier is preserved on disk, and is restored if the system is rebooted.
5. Date. Filled in by the WITS sender using the system date.
6. Time. Filled in by the WITS sender using the system time.
7. Activity Code. A short (16 bit) integer, the WITS sender uses the value typed in on the first of the screens above. However, if the Orchestrator channel corresponding to this item is enabled and a source channel is configured, the value in this channel will be used instead; however, if this channel is in error, the typed in value will be used instead.

This list explains most of the information in the *WITS Information* part of the screen. The only other item is the transmission rate, which is how often the WITS records are sent out, in the above example once a minute. Both records will be send out once a minute on the minute boundary, on successive scans, so there will be a short delay between records. However, the timestamp of each record will be the same.

The sender can be configured to transmit just record 1, just record 18 or both record 1 and 18.

The channel summary information on the first screen has one extra column compared to the WITS receiver, which defines how the WITS record item is derived. For most channels, this will be the value in another Orchestrator channels, for instance item 9 of record 18 is derived from channel RH51. The value actually sent can be the raw (instantaneous) value of the channel, the minimum value of the channel, the maximum value of the channel or the average value of the channel. The value sent is kept in the channels registered by the WITS sender until the next record is sent. Minimum, maximum and average values are calculated by inspecting the instantaneous value of the channel at the scan rate of the WITS sender, and are reset after a record has been sent.

The other two screens are channel configuration screens. Most of the fields on these are standard Orchestrator fields. The exceptions are:

- long field description, displayed just below the *Enabled* checkbox, which is taken from the .INI file as for the WITS receiver
- field value, which allows the value for an alphanumeric field to be specified. Only one item (item 8 of record 18) is an alphanumeric field, and so this the corresponding channel (53) is the only channel for which this field is available
- source channel, for all other items, the Orchestrator channel used to derive the value put into the WITS record
- calculation, which defines how the source channel is used to derive the value in the record, and can be None, Average, Minimum or Maximum

For header items, the source channel and calculation fields are available for the *side-track / hole section number* and *activity code* items, allowing the default values to be overridden. This could be done, for instance, to set the values transmitted for these items to be the values received from a WITS receiver. For the other header items, neither the source channel and calculation fields nor the text value fields are available.

If a channel is not configured, or the source channel is left blank, the WITS record sent will not contain a value for the corresponding item. If the source channel is in error, then the record will contain the value -8888 for that item, the WITS indication of a broken sensor.

Text fields are sent with no leading or trailing spaces, unless these have been explicitly entered into the configuration screens.

Apart from the well identifier (a text field) Fields in the WITS record header are sent as numeric values with no leading or trailing spaces, and no decimal points. Leading zeros are also suppressed, unless the value to be transmitted is 0, when a single 0 is sent. Time is sent is the format hhmmss, for instance 132506 for 25 minutes and 6 seconds after 1pm. However, as leading zeros are suppressed, 5 minutes and 25 seconds after midnight will be transmitted as 525 and midnight itself as just 0. Date is sent in yymmdd format, for instance 980814 for the 14$^{th}$ August 1998. The 14$^{th}$ August 2000 will be transmitted as 814, as leading zeros are suppressed.

Other fields are sent as numeric fields to two decimal places, with no leading or trailing spaces. Values below 1 and above –1 are sent with a leading zero (e.g. 0.50), but other values will have no leading zeros. Negative values are preceded with a minus sign, but positive values are not preceded with a plus sign.

The WITS sender reports no error messages apart from standard Orchestrator scanner initialisation errors. This is because the WITS protocol does not allow for the receiver to acknowledge records, so the WITS sender has no way of knowing whether or not what it has sent has been successfully received.

# 7. CLIENT LOGGING SYSTEM

## 7.1 DESCRIPTION

This document is the User Manual for modifications to the EdgeX system already supplied to Expro North Sea. The modifications are to provide the background transfer of the server system log files to a client system over a slow network link. The result of these modifications is that the client system has a copy of the server system log files, which means that reporting tasks (i.e. trends and data export) which run on the client system can act on files held on its own hard disk, rather than having to access the log files over the slow network link.

There will be two differences between the log files on the client system and those on the server system:

1. The client system log files will be slightly smaller as the first log in the server Logfile is not copied to the client system

2. The stop time in the filename of the client system log files may differ from the server system log files - the server system uses the time at which the logger was stopped to determine the stop time, while the client system uses the time of the last log in the Logfile to determine the stop time

The functionality of the EDGE system introduces an extra complexity, which is that the information in the server system log files can change after it has initially been logged. This means that information that has already been transferred to the client system can become incorrect, and need to be transferred again. This transfer should be done in such a way that the client system does not drop significantly behind the most recent information logged by the server system.

The client system maintains status information in the system registry. On start-up, this status information is used to get the client system to continue from where it left off.

A key feature of the architecture is that all tasks that write information to disk only do so to local hard disks. There is no writing to disk over a network link. This helps to ensure that the log files held on the client system are always in a consistent state.

### Architecture

The client logging is split between two tasks. One task runs in the background doing the transfer of logged data from the server to the client. The second task is a user interface task, that allows the user to monitor what the background task is doing and to allow the server system to be selected.

The background task periodically (once a minute) looks on the server system to see if any information has been logged by the server system logger since it last looked. It is possible that the server system may have started a new Logfile has been started, or that the name of the logger (and hence the directory where information is logged) has changed. Any new information that has been logged is read by the task and written to a Logfile on the client system's local hard disk. The client system maintains the same directory structure for logged data as the server system.

Less frequently (once every 10 minutes) the task also checks to see if there have been any recalculations done on the server system. It is possible that these recalculations affect not only the current logfile but also logfiles that have already been closed. To transfer the information that has been recalculated, the client system needs to know the date and time from when the recalculation was done. All information logged on and after this time needs to be transferred to the client system. Obviously, over a slow network link, this may take some considerable time. For instance, if the system is logging 150 channels once per minute, the amount of information logged per day is about 1¾ Mbytes. If the effective speed of transfer of information over the network link is 1000 bytes per second, then it will take about ½ an hour to re-transfer the data for one day. If the recalculation is from more than a day old, or if the network speed is slower, then the re-transfer time will increase accordingly.

To avoid the re-transfer of recalculated data from preventing the transfer of the most recently logged data, a separate thread is used to check for and to re-transfer recalculated data. This thread runs in parallel with the main task of transferring the most recently logged data, but at a lower priority. Furthermore, to try to avoid re-transferring data more than once, the re-transfer thread does not start a re-transfer unless there have been no recalculations initiated on the server system within the previous half hour. As the system clocks on the client and the server system may be different, the timing for this is implemented solely in the client software - a re-transfer is not started until at least half an hour after the client software has noticed that a recalculation has finished on the server system. Therefore, the client software may effectively re-transfer several recalculations at once.To function as described above; the task that runs on the client system requires access to the following information that is maintained by the server system:

- the name of the server system logger (logger number 1)
- the current status of the logger (whether it is enabled or disabled, and, if enabled, the number of logs in the current Logfile)
- the names of the log files created on the server system
- a history of what recalculations have been done on the server system

The first two items in the above list are available through standard EdgeX Client/Server library calls; the third item can be determined by file access over the network link. However, the final item can only be determined by a change to the real-time / historic calculator software that runs on the server system:

- after each recalculation has been completed, the real-time / historic calculator appends to a file the date and time from when the recalculation was done

The name of this file is based on the name of the system logger, and is stored in the EXAL_DATA directory. For example, if the system logger is called *Wilson24*, the file is called *Wilson24.rts*.

This functionality has been incorporated in version 1.14 and later versions of the real-time / historic calculator program (rthc_ru.exe).

## 7.2 INSTALLING/REMOVING SOFTWARE

The client logging software is installed on a system when the Edge software is installed on the client system. The background task is registered as a Windows NT service called *Orc Client Logging*. A user called *ClilogServiceUser* (password *Clilog*) is created and the service is configured to log on as this user. This user must have access rights on the server. The easiest way to achieve this is to install version 2.00 or later of the Edge software on the server as well.

The service is initially created with a start-up setting of *Manual*. To start the service, use the *Services* applet in Control Panel to start the service. To automatically start the service whenever the client system is started up, change the start-up setting of the service to *Automatic*.

## 7.3 REMOVING THE CLIENT LOGGING SOFTWARE

To remove the client logging software from the system perform the following steps:

1. Ensure that the client logging monitor program is not running

2. Under Windows NT, stop the *Orc Client Logging* service using the Services option in Control Panel. Under Windows 95, terminate the program *Clilog.exe*. The running programs can be seen by pressing Ctrl-Alt-Delete.

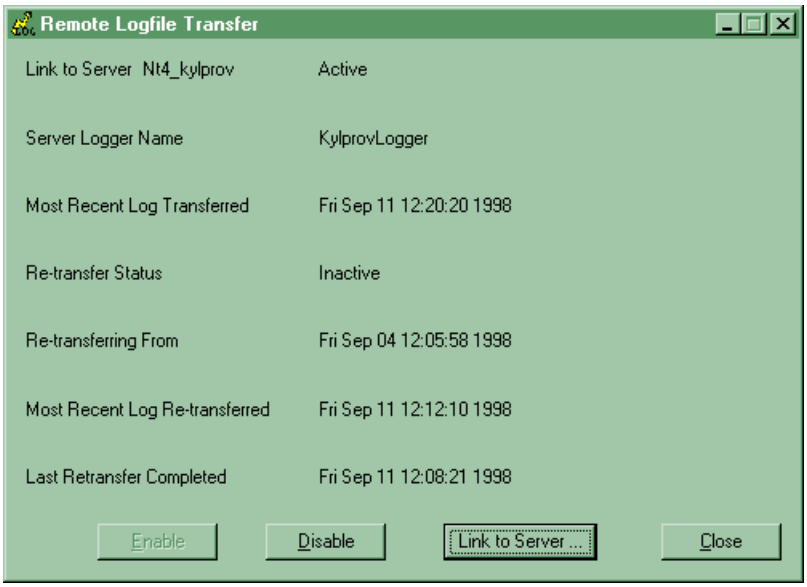
3. From an MS-DOS prompt, change to the \EDGEX\BIN directory and entering the command *CliLog -u*. The software should report *The Orc Client Logging service has been removed*

4. Delete the icon from the EdgeX program group that runs the client logging monitor (this is installed when the Edge software is installed)

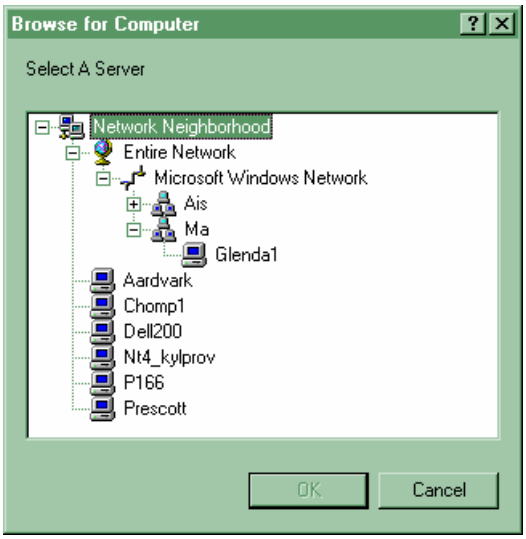
Delete the files *CliLog.exe* and *CliLogVw.exe* programs from the \EDGEX\BIN directory

## 7.4 MONITORING THE TRANSFER

A monitor task can be run on the client system that displays information about the current state of the link to the server system. This display is as follows:




The top line of this display shows the name of the server from which the client logging software transfers logged data. The first time the software is run, this will show . (dot) indicating the local system. To select another server, click the *Link to Server ...* button. This displays a dialog showing the computers on the network, and allows one of these to be selected:



There are four possible states for the link to the server system:

1. Disabled. The software has been disabled by clicking the Disable button on the above menu. In this mode, the service software is still running, but it will not attempt to access the server system or do any Logfile transfer. This mode is retained even if the client system is rebooted. To resume Logfile transfer, click the Enable button
2. Active. The network link to the server system is available, and EdgeX is loaded and enabled on the server system
3. Inactive. The network link to the server system is available, but EdgeX is not enabled on the server system
4. Unavailable. The network link to the server system is not available

The menu also displays the name of the current logger on the server system, and the date and time of the most recently transferred log.

The Re-transfer status can be either Active or Inactive. Active indicates that a re-transfer is currently underway, Inactive indicates that there is no re-transfer at the moment. If a re-transfer has occurred, the dates and times from when the re-transfer are being done from, and of the most recently re-transferred log are displayed. These dates are derived from the logged data that is re-transferred. The screen also displays the date and time when the most recent re-transfer completed. This is taken from the system time on the client system.

If there is a problem accessing the server, error messages can appear on this menu in one of four places:

1. Immediately underneath *Link To Server*. This indicates that an error linking to the server occurred
2. Immediately underneath *Most Recent Log Transferred*. This indicates that an error occurred transferring a log from the server to the client. The error can either be at the server end (i.e. while reading the log) or at the client end (i.e. while writing the log). The error message indicates which end caused the error
3. Immediately underneath *Re-transfer Status*. This indicates an error accessing the re-transfer status file on the server system
4. Immediately underneath *Most Recent Log Re-transferred*. This indicates that an error occurred re-transferring a log from the server to the client. The error can either be at the server end (i.e. while reading the log) or at the client end (i.e. while writing the log). The error message indicates which end caused the error

There are two errors messages that may occur under normal operation:

1. If the server is not currently logging, and the client has transferred all the logged data from the server, the message *Server: There are no more files* will be displayed underneath *Most Recent Log Transferred*

2. If there have been no recalculations done on the current logger by the server system, there will be no recalculation status file for the current logger. This will be reported on the menu underneath *Re-transfer Status* as *The system cannot find the specified file.*

# 8. MODBUS INTERFACE

## 8.1 INTRODUCTION

This documentation provides a general instruction on Modbus capabilities. There are many differences from vendor to vendor and Modbus capability. Specific information (Modbus registers, type, etc.) must be available and fully understood in order to successfully configure and interface between parties involved.

**Parts of this instruction make specific references to a typical Schlumberger configuration, which is used as example and aid for faultfinding.**

Modbus RS232 differentiates from simple RS232 in that multiple users can be on the same RS232 line. Modbus can have a single master and several slaves, where the slaves are usually sources of generated data. Data is passed on to common areas (referred to as Modbus registers). With this in mind, Expro systems are typically set up as masters and use the Modbus to request data from the 3rd party slave. (E.g. Schlumberger, CorrOcean, Clamp On, etc.)

There are several issues to configure between Modbus systems and this should not be confused with the simple 'ASCII' device option, which exists within EdgeX.

There are several types of format that 3rd party vendors can provide data on to a Modbus. This is an extremely important issue for all users to understand irrespective of any technical configurations to achieve.

Modbus registers (memory allocations) can only handle a single 16-bit number. In many situations this is more than adequate for transferring simple data. High-resolution data (typically required for down hole gauges) would not be achieved with a single16 bit register. If users were forced to use a single register, the following limits could apply.

| Pressure scale span | Resolution |
|---|---|
| 100 | 0.002 |
| 1000 | 0.015 |
| 5000 | 0.076 |
| 10,000 | 0.153 |
| 16,000 | 0.244 |

Table 1

From above table it can be seen that the best resolution that can be achieved from a fully ranged 0 – 16,000-psi gauge is 0.244psi.

If the user reduced range from say 5000 – 10,000 (span of 5000), the resolution achieved is 0.076psi. This may still not be acceptable for reporting gauge data and also is dependant on user selecting the correct range during the test. In practice (for DST type work), manually changing scales to achieve an optimum range is unpractical.

If any 3rd party used this or similar method, then it is an issue that should be raised with the clients

The ideal method of achieving full precision is to use 2 * Modbus registers to transmit a single item of data.

This would imply the splitting up of a full precision data value into 2 component parts for transmission and recompiled back by the master. There are several ways to achieve this and both Master and Slave environments must be fully interfaced in advance for reliable handling of data.

This is elaborated upon in next sections.

## 8.2 GENERAL CONFIGURATION

Users should note by default that EdgeX systems are configured with Modbus Master Drivers (System Device) and Modbus Slave Drivers (System Processor). These drivers provide the necessary basics for the Modbus standard to initialise ONLY.

To enable effective transmission of data over Modbus, several criteria must be known and agreed upon in advance.

These include: -

- Data types/Number formats
- Protocols
- Registers

**Data Types/Number Formats**

There are multiple formats (using single and double registers) that can be used for Modbus data.
The following 4 types of interface exist within the EdgeX system to handle different data types & number formats. It should be noted that any of the types need not be unique to the specific company they are referenced to. The actual interface type they use may be allocated to alternative slave provider. The calculations for these are included in the 'Orchestrator Real Time' processor by default.

**Modbus32** Interface
This calculation is based on one that is used by Schlumberger. It is not a standard format but achieves full resolution by combining low & high order 16-bit integers into a single floating point number. **The exact detail of the transformation used is not highlighted here.**

**CorrOcean Modbus Interface**

(N.B. This interface is currently named as per data provider, but not necessarily unique.)

CorrOcean use two signed Modbus registers to hold the engineering value. The first register is multiplied by 256, the second register is divided by 256 and both values are added together to resolve the engineering value. **This example could potentially lose resolution over the conversion.**

**Linear Modbus Interface (e.g. Wood Group)**

WGPT use a single unsigned Modbus register to hold the engineering value. This is achieved by having the values 0 to 65535 represent a value within set minimum and maximum limits. The calculation to be carried out is as follows

Engineering = Minimum Limit + ((Maximum Limit – Minimum Limit) / 65535 * Register Value)

**This example could potentially lose resolution over the conversion.**
**Also, users are required to enter a minimum & maximum value (e.g. 0 & 10,000) for a calibrated range. Higher resolution could be achieved if spanned values were less (e.g. 6,000 & 8,000). This would be OK if both values were set by the 'Master' & the 'Slave' assuming values would not exceed the limits. This may not be practical in real situations and users should NOT attempt to constantly change these values during a test.**

**Combine & Divide Interface**
This transformation is ideal and preferred method of interface.

- *Use **2** Modbus registers to hold the engineering value.*
- *Determine the resolution of the sensor required by the Client.*
- *Ask the slave provider to multiply the calculated engineering value by the appropriate scaling factor e.g. Resolution of 0.001 = scaling factor of 1000, resolution of 0.005 = scaling factor be 200, etc.*
- *Ask the slave provider to take the integer part of the new calculated value and split it into its high and low order words. (See example below)*
- *Create a RTHC Combine and Divide calculation that uses the two Modbus registers and the scaling factor as inputs. This single calculation computes the engineering value in the desired resolution for the Client.*

**High & Low order values in Modbus registers are decoded back to original engineering value by RH**

**'*Combine & Divide*' Interface.**

Combine and Divide example. (Provided by slave)

| | | | | | |
|---|---|---|---|---|---|
| Actual Engineering Value | | = | 9123.654 | | |
| Resolution required | (*Divisor) | = | 0.001 (Equates to scaling factor of 1000) | | |
| Integer representation of value | | = | 9123.654 * 1000 | = | 9123654 |
| High Order Integer | (*MSW) | = | Int ($9123654/2^{16}$) | = | **139** |
| Low Order Integer | (*LSW) | = | (Int (Frac ($9123654/2^{16}$) * $2^{16}$)) | = | **14150** |

***** Denotes references used in RH user configuration.

**Protocols**

RS232 protocols (e.g. Port, Baud Rate, etc.) are used for system synchronisation.

Typical protocols are identified in section 9.3 (Configuration).

**Registers**

Register maps are used to segregate different types of data.

There are certain rules, which dictate the register data types that can be used, and these are not listed here. It is usually the slave which dictates what type to be passed to the Modbus Master.

The common types are: -

| Data Type | Range address start |
|---|---|
| Coil status | 0 |
| Input status | 10,000 |
| Input register | 30,000 |
| Holding register | 40,000 |
| General reference | 50,000 |

E.g. 2 engineering values transferred in 2 * 16 bit integers each as 'Input Registers' could be allocated 4 data indexes 30,081 - 30,084

Unallocated registers within a range are not allowed. Valid register mapping should be consecutive.

***Note. Systems may start their base value at either 0 or 1.***

***It may be necessary to offset channel mapping by 1 if the master and slave use different bases.***

**The following sections implicitly apply to EdgeX configuration for Schlumberger ASU. Alternative 3rd party data should be superimposed where applicable.**

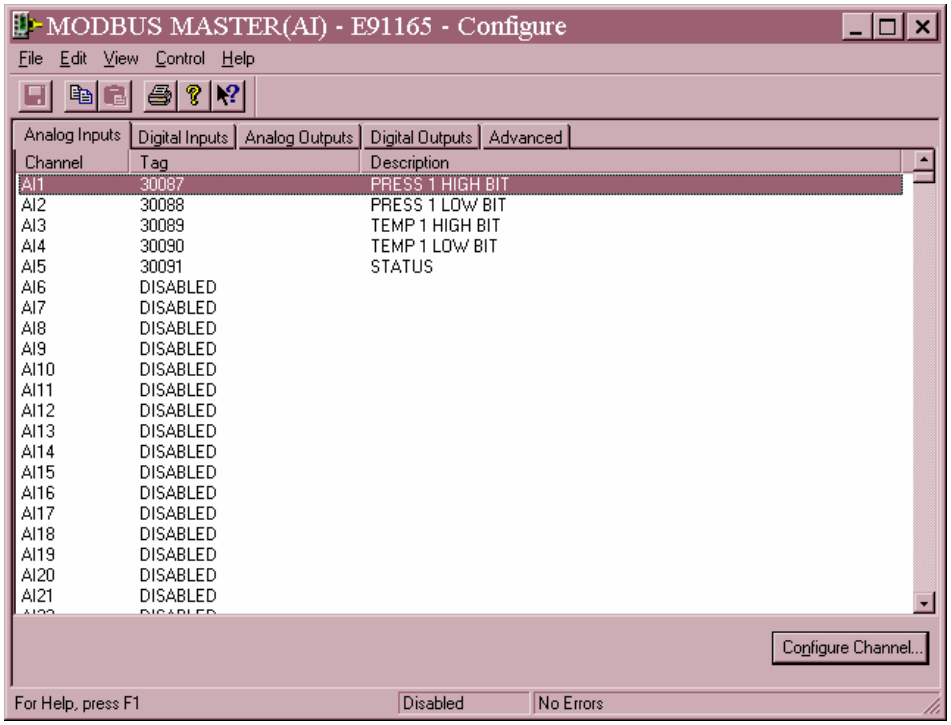
## 8.3 CONFIGURATION

EdgeX is configured as a ***'Master'*** and Schlumberger ASU is configured as a ***'Slave'*** (via Dipswitches on front of ASU).

Access {*Devices, Master Modbus*}

Click on tab *'Analog Inputs'* to display the following.

*(Ignore the Analog Outputs and the Digital Inputs/Outputs)*



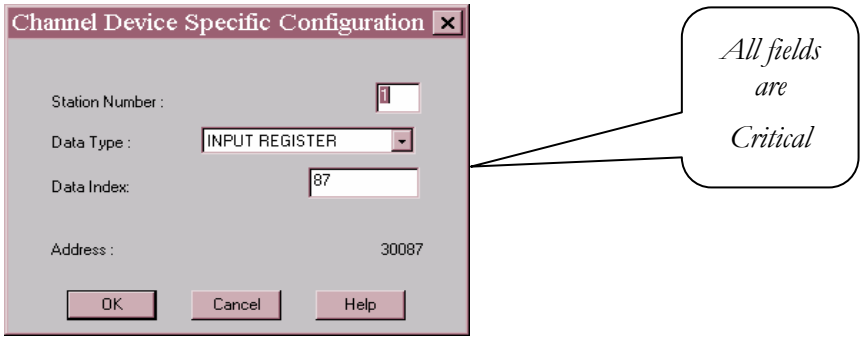

**Never have any Modbus Master channels enabled that are not being used, as this will return global errors for the whole interface.**

Click/highlight on the first AI channel and then 'Configure *Channel'* button to edit Tags, etc.

This is optional, as most default settings should be adequate.

Within each channel, Click on *'Device Specific'* to display the following: _

Note that the station number reference (the 'Slave') here is the 3rd party (Schlumberger)

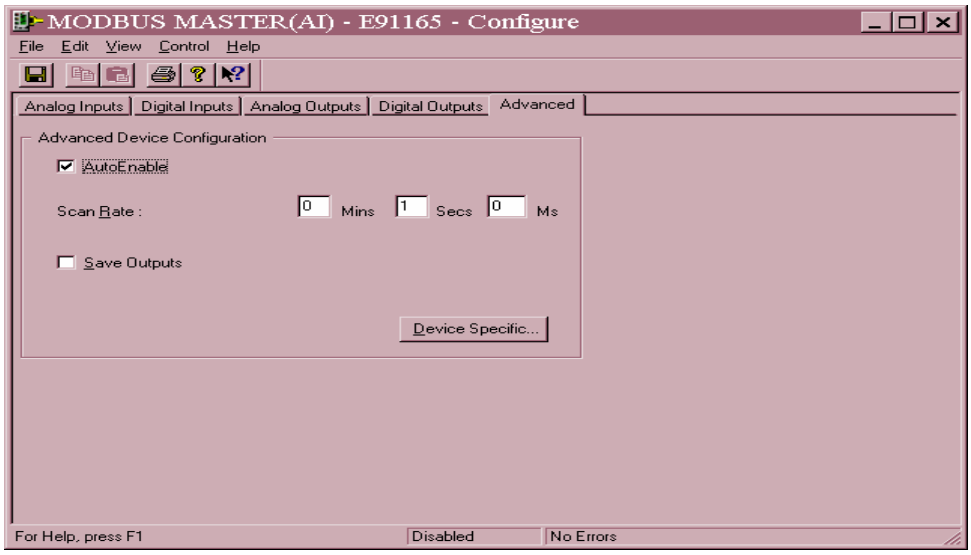



Edit as appropriate for each of the channels required as per the table below.

NB. The addresses listed in this table are typical. Schlumberger may or may not allocate different settings. These must be known.

| | Channel | | | | | |
|---|---|---|---|---|---|---|
| | AI1 | AI2 | AI3 | AI4 | AI5 | |
| **Tag** | 30087 | 30088 | 30089 | 30090 | 30091 | Any user tag |
| **Description** | Press 1 High Bit | Press 1 Low Bit | Temp 1 High Bit | Temp 1 Low Bit | Status | Any user description |
| **Station Number** | 1 | 1 | 1 | 1 | 1 | Slave address |
| **Data Type** | Input Register | Input Register | Input Register | Input Register | Input Register | Data type MUST match provider's |
| **Data Index** | 87 | 88 | 89 | 90 | 91 | * See note below |
| **Address** | 30087 | 30088 | 30089 | 30090 | 30091 | |

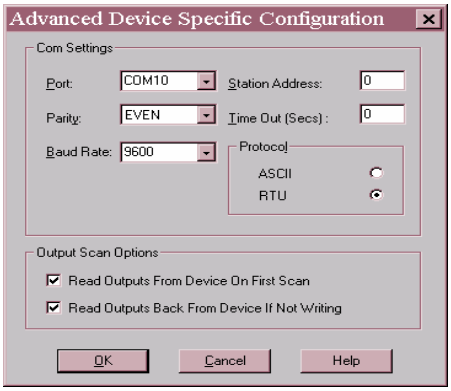
*** Note that Expro initial address equals 30000 and Schlumberger initial address equals 30001, therefore addresses are offset by 1. An offset can occur with other providers.**

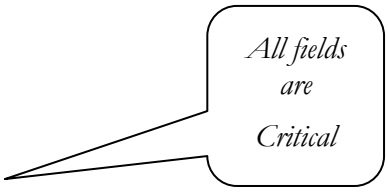



From the Master Modbus initial screen, click on the tab *'Advanced'* to display the following.-

Ensure *AutoEnable* is checked on for the application to restart automatically on any reboots, EdgeX disable/enable, etc.

From the Master Modbus initial screen, click on the tab *'Advanced'* & '*Device Specific*' option to display the following.:-



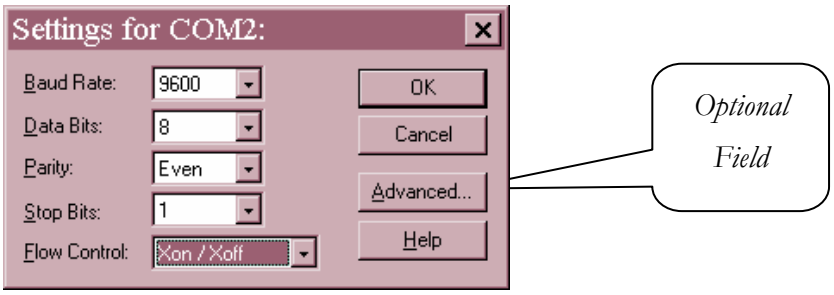

Expro set-up as Master uses address 0. (Schlumberger ASU is slave set to address 1).

Com 10 is regular default port for EdgeX Modbus Master. Use alternative spare port if necessary.

All other fields **MUST** match. Close down Modbus Master and save settings.

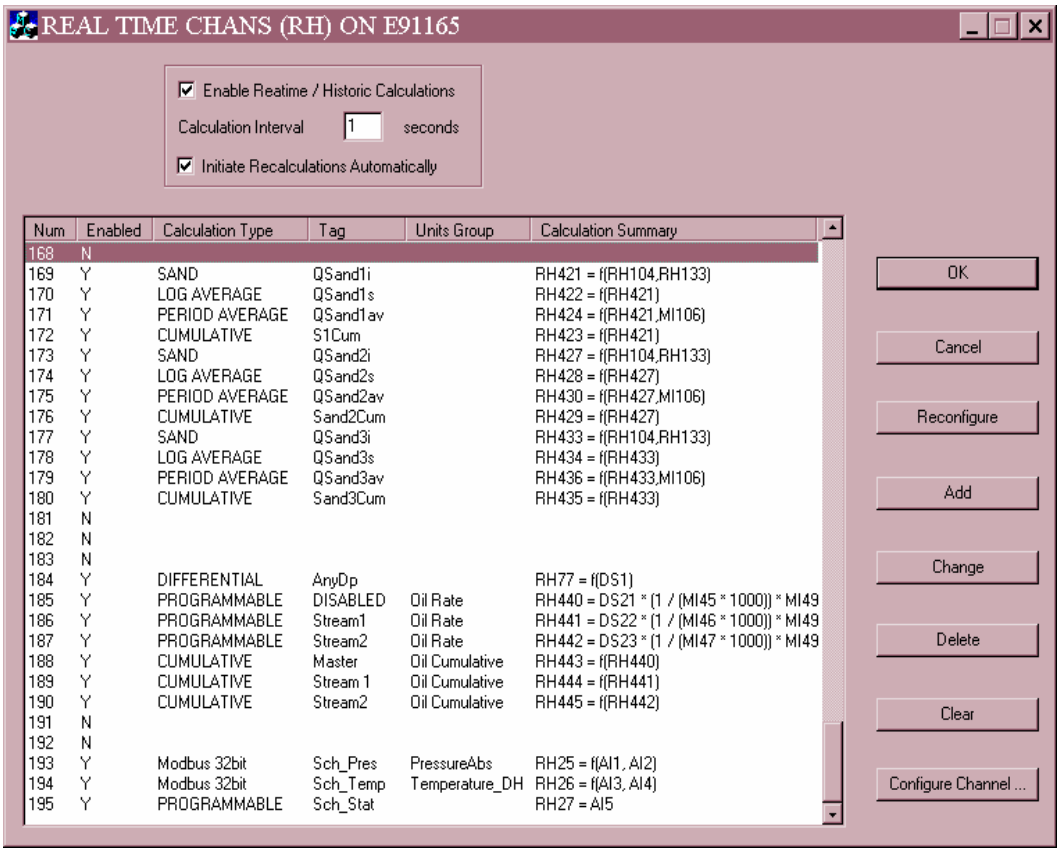
Access {*Start, Settings, Control Panel, Ports*}

Select the Com Port in use (Not necessarily COM2 as per this e.g.) and ensure the following settings. OK and close down Control Panel.




Access {*Processors, Real Time Chans (RH)*}

Scroll down to end (approx. calculation numbers 193 – 195) and note the 'Modbus 32bit' channels.

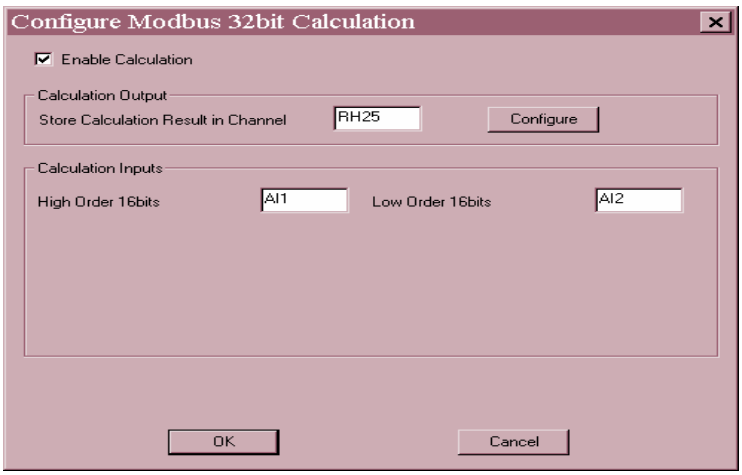



| Num | Enabled | Calculation Type | Tag | Units Group | Calculation Summary |
|---|---|---|---|---|---|
| 168 | N | | | | |
| 169 | Y | SAND | QSand1i | | RH421 = f(RH104,RH133) |
| 170 | Y | LOG AVERAGE | QSand1s | | RH422 = f(RH421) |
| 171 | Y | PERIOD AVERAGE | QSand1av | | RH424 = f(RH421,MI106) |
| 172 | Y | CUMULATIVE | S1Cum | | RH423 = f(RH421) |
| 173 | Y | SAND | QSand2i | | RH427 = f(RH104,RH133) |
| 174 | Y | LOG AVERAGE | QSand2s | | RH428 = f(RH427) |
| 175 | Y | PERIOD AVERAGE | QSand2av | | RH430 = f(RH427,MI106) |
| 176 | Y | CUMULATIVE | Sand2Cum | | RH429 = f(RH427) |
| 177 | Y | SAND | QSand3i | | RH433 = f(RH104,RH133) |
| 178 | Y | LOG AVERAGE | QSand3s | | RH434 = f(RH433) |
| 179 | Y | PERIOD AVERAGE | QSand3av | | RH436 = f(RH433,MI106) |
| 180 | Y | CUMULATIVE | Sand3Cum | | RH435 = f(RH433) |
| 181 | N | | | | |
| 182 | N | | | | |
| 183 | N | | | | |
| 184 | Y | DIFFERENTIAL | AnyDp | | RH77 = f(DS1) |
| 185 | Y | PROGRAMMABLE | DISABLED | Oil Rate | RH440 = DS21 * (1 / (MI45 * 1000)) * MI49 |
| 186 | Y | PROGRAMMABLE | Stream1 | Oil Rate | RH441 = DS22 * (1 / (MI46 * 1000)) * MI49 |
| 187 | Y | PROGRAMMABLE | Stream2 | Oil Rate | RH442 = DS23 * (1 / (MI47 * 1000)) * MI49 |
| 188 | Y | CUMULATIVE | Master | Oil Cumulative | RH443 = f(RH440) |
| 189 | Y | CUMULATIVE | Stream 1 | Oil Cumulative | RH444 = f(RH441) |
| 190 | Y | CUMULATIVE | Stream2 | Oil Cumulative | RH445 = f(RH442) |
| 191 | N | | | | |
| 192 | N | | | | |
| 193 | Y | Modbus 32bit | Sch_Pres | PressureAbs | RH25 = f(AI1, AI2) |
| 194 | Y | Modbus 32bit | Sch_Temp | Temperature_DH | RH26 = f(AI3, AI4) |
| 195 | Y | PROGRAMMABLE | Sch_Stat | | RH27 = AI5 |

Note that the pressure and temperature allocations (Calculation Nos. 193 & 194) use the `Modbus 32bit` type routines.

The error channel from Schlumberger does not require any computation (Calculation No. 195) and therefore is just an RH channel one to one relationship using the `Programmable` type routine.

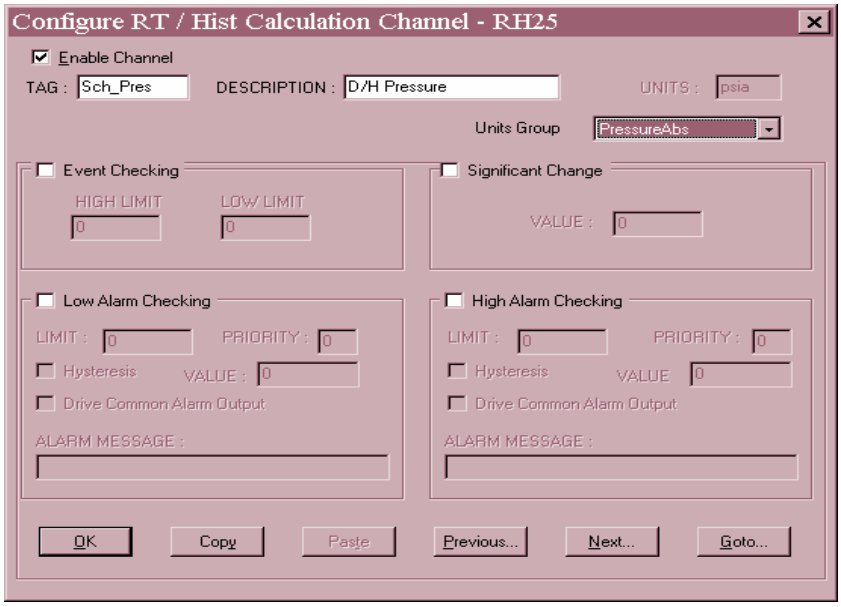
Double-click on theModbus32bit (Sch_Pres) pressure channel to view the calculation inputs/ouptuts used to convert the 2-part channel back to a single pressure value.




The Modbus Master Input channels (AI) are used as the inputs.

Note that the first half of the 32-bit number from one AI allocation is the high order 16 bit and the second half the low order 16 bit.

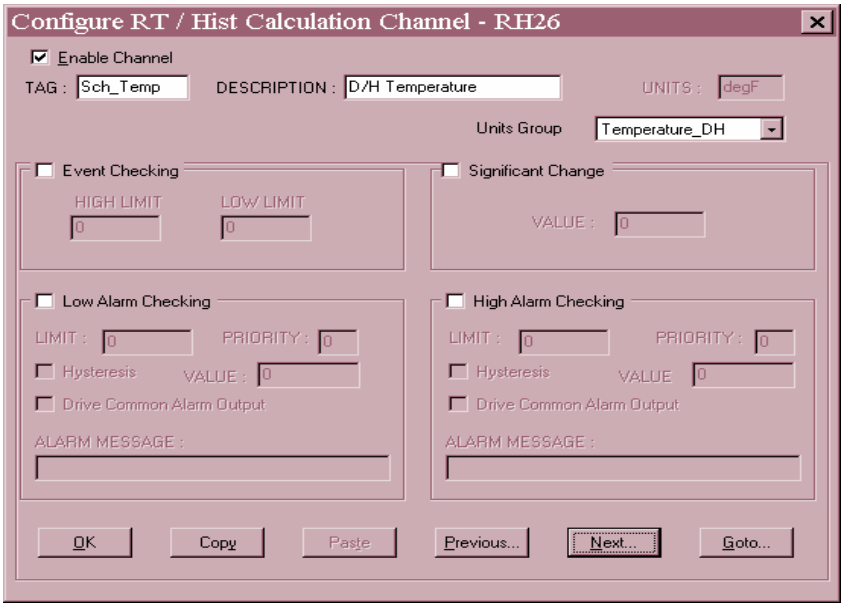
Select 'Configure' for the RH channel parameters to display the following.




The 'Units Group' uses the PressureAbs option that is normally set to output psia.

From the RT/Hist main display, double-click on theModbus32bit (Sch_temp) temperature channel to view the calculation inputs used to convert the 2-part channel back to a single temperature value.

Verify the inputs/outputs for the temperature channel.




Select 'Configure' for the RH channel parameters to display the following.

The 'Units Group' uses the 'Temperature_DH' option that is normally set to output degF

This degC to degF conversion will take effect without any other user configuration.

(Schlumberger send temperature in degC)

As per above, the default allocations assume only one pressure and temperature signal.
Repeat identical configurations with appropriate channels to add additional inputs.

Exit and save RH channel configurations.

Ensure all AI & RH channels as defined above are logged to disc for post evaluation/historic reporting.

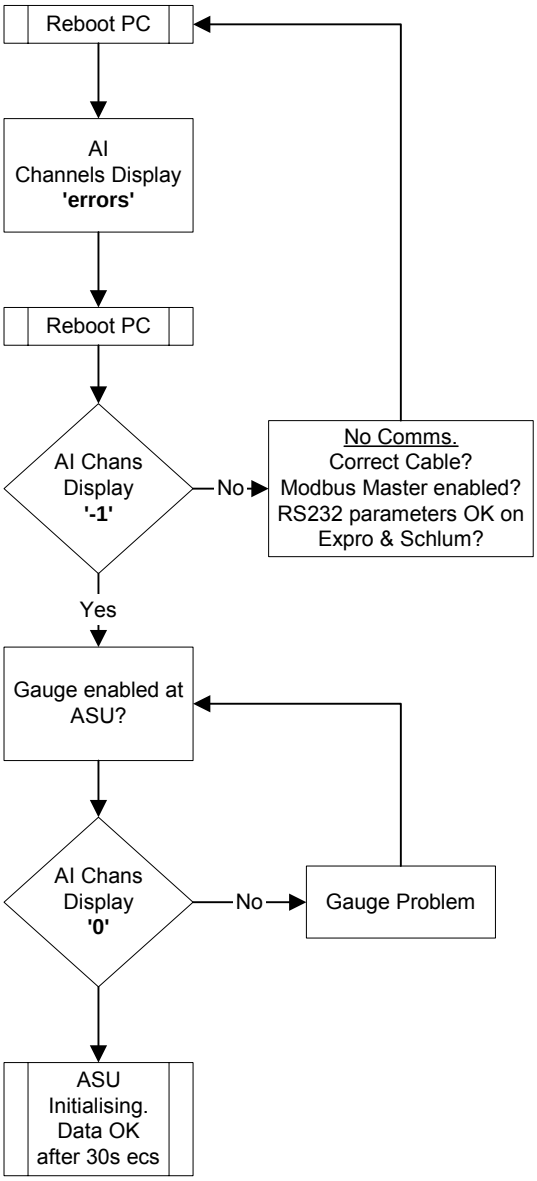
Exit EdgeX to save configurations under a user ***.ORC*** setting.

**REBOOT PC (Recommend same to Schlumberger user for PC & ASU after any settings change.)**

## 8.4 REAL TIME USAGE

There are no user controls necessary during real time, other than ensuring that the Modbus and RH channels are included in the current log files and the Modbus system *AutoEnable* mode is checked on.

The following fault finding sequence should be noted after configurations above.



## 8.5 WIRING REQUIREMENTS

An RS232 configured lead connects the system. (See NTED-ASU cable configuration for Schlumberger use only)
Alternative systems use PC-PC-S2. This is same as standard RS232 moulded able as purchased from RS components.

| 9-way F | 9-way F |
|---|---|
| 2 | 3 |
| 3 | 2 |
| 4 | 6 |
| 5 | 5 (common) |
| 6 | 4 |
| 7 | 8 |
| 8 | 7 |
| Screen | Screen |

## 8.6 MODBUS MASTER DRIVER ERRORS

Types of Errors
There are a number of different categories of error message.

| Type of Error | Related to |
|---|---|
| Modbus Errors | Errors detected by the Modbus module |
| Data Link Layers Errors | Errors detected in Serial Communications |
| Application Layer Errors | Errors detected in Serial Communications |
| Win32 Errors | Standard Windows Errors |
| Time Out Errors | Slave Device Not Responding |

Format of Error Messages

```
S <Number>, D <Data Address>   : Type of Error < Error Code>
```

| Station Number | 1st Address of block error occurred in See Note Below | Type of Error See above | Particular Error |
|---|---|---|---|

Note: The data address refers to the first address of a block that an error occurred in.

Example

A PLC has 20 Holding Registers (40001 – 40020). The Modbus Master Driver tries to read items 42000 – 42010 as these have all been configured to channels. The read will fail, and an error message will be reported.

The error displayed:

At Orchestrator main screen : `DEVICE: MODBUS MASTER S1, D42000: Modbus0x2`
And
At Modbus main screen `S1, D42000: Modbus 0x2`

Explanation of Error Codes

Here we will

- Name the type of error message
- Give its format/syntax
- Describe the error codes contained in the category
- Document the meaning of each of the errors
- Give appropriate examples

**Type 1 - Modbus Errors**

Syntax `S<Number>, D<Data Address>: MODBUS<Error Code>`

| Error Code | Meaning |
|---|---|
| 01 | Illegal Function |
| 02 | Illegal Data Address |
| 03 | Illegal Data Value |
| 04 | Slave Device Failure |
| 05 | Acknowledge Failure |
| 06 | Slave Device busy |
| 07 | NAK Received |
| 08 | Memory Parity Error |
| 09 | Zone Overlap |
| 0A | Header Error |
| 0B | Slave Absent |
| 0C | CRC Error |
| 0D | Transmission Blocked |
| 0E | Incorrect Length |
| 0F | Slave Timeout |

*Example:* `S2, D40001: MODBUS 0E`
*Meaning:* Station number 2, Data Address 40001 = Incorrect Length

**Type 2 - Data Link Layer Errors**

Syntax `S<Number>, D<Data Address>: DATA LINK<Error Code>`

| Error Code | Meaning |
|---|---|
| 01 | Timed Out |
| 02 | Unexpected Control |
| 03 | Buffer Overrun |
| 04 | Bad Error Check |
| 05 | Duplicate Packet |
| 06 | NAK Received |
| 07 | Packet is too small |

*Example:* `S2, D40001: DATA LINK 02`
*Meaning:* Station number 2, Data Address 40001 = Unexpected Control

**Type 3 - Application Layer Errors**

Syntax `S<Number>, D<Data Address>: APP<Error Code>`

| Error Code | Meaning |
|---|---|
| 01 | Wrong Station |
| 02 | Wrong Command |
| 03 | Wrong Transaction |
| 04 | Write Failed |

*Example:* `S2, D40001: APP 01`
*Meaning:* Station number 2, Data Address 40001 = Wrong Station

**Type 4 Win32 Errors**

Syntax `S<Number>, D<Data Address>: WIN32<Error Code>`

*Error Codes*

*The Error Codes for Win32 related errors can be found in the Win32 documentation*

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# 9. SOFTWARE

## 9.1 EDGEX INSTALLATIONS

**Introduction**

**Note that ScadaPro replaces the term Orchestrator in any revised instruction.**

**During installation the name EdgeX is used and takes over any reference to the term ScadaPro**

EdgeX systems are typically installed on PC platform using Windows NT (workstation). Newer systems are supported on Windows XP.

**In all cases, the PC hard drive must be formatted to NTFS to enable system security options!**

**Sentinels and Software Keys**

**ScadaPro requires a sentinel on the parallel port *OR* a Software Key for installations and to enable real time operations!**

**Sentinel Information**

There are 2 predominant levels of Sentinel supported for EdgeX:

1. EdgeX Server (Full version)
2. EdgeX Client

Whichever level is required, it should only be necessary for a **single** Sentinel to be connected to the parallel port.

The Sentinel is always available for multiple EdgeX re-installs, unless the driver is removed or the hard disk is reformatted.

Sentinel keys are downward compatible, (i.e. full version can be used on any software installation).

**Software Key Information**

If you were not provided with a Sentinel then a Software Key will be required to install EdgeX.

This is provided with the software at the time of issue.

Users should note that this is dependent on a unique key identifier generated from the local hard disk and this key will not enable installation of EdgeX on another PC.

**If the hard disk is reformatted, then the key will become invalid and a new code will be required – Contact Group Engineering for a new Software Key**

**ScadaPro Build and/ or Upgrade**

Prior to installations ensure the following: -

- All other programs are terminated
- System logged on with Administrator Rights

To begin installation of EdgeX, insert the CD into the CD drive. The CD should now autorun displaying the installation menu:

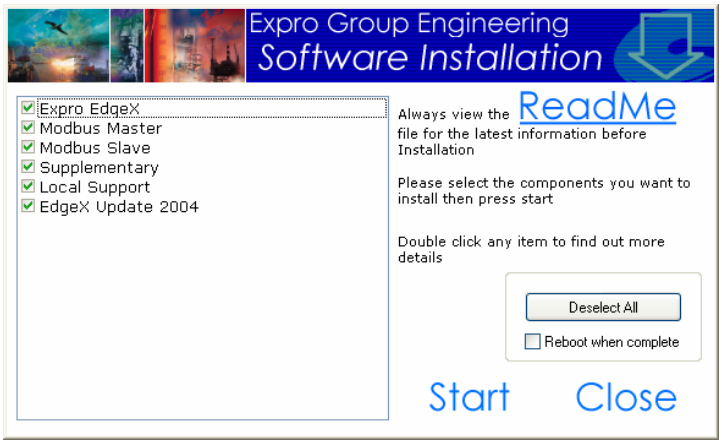

Should the CD fail to autorun use Explorer to navigate to the CD drive and launch '**Autorun.exe**'

If this is the first time that EdgeX will be installed on this PC or if the PC has been re-imaged with a new Operating System then keep the default option of '**Install EdgeX'**.

**Instructions on uninstalling EdgeX and setting EdgeX Access Levels are found later on in this document**

**Installation of EdgeX**

The following screen will appear with the option to install all of the components shown below:




To obtain version information on the install and for any new instructions or additional information it is recommended to view the ReadMe file. Click **'ReadMe'** to view this.

As default *all* EdgeX components are selected for installation. To reboot the PC automatically when complete tick the 'Reboot PC' checkbox.

To begin EdgeX installation click **'Start'**.

**The following pages will now guide you through step-by-step instructions for installing EdgeX.**

**EdgeX Server**

Expro Group's surface data acquisition system

The EdgeX Server installer will load automatically once the previous install has completed.

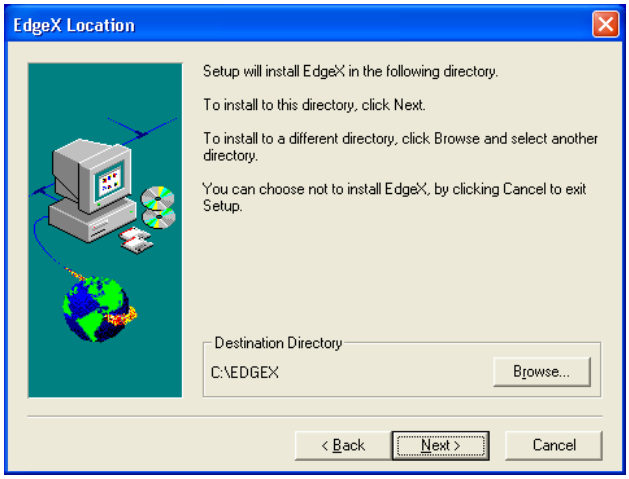
**At this point please ensure that the Sentinel is connected (if required) or that you have your Software Key ready!**

**EdgeX Server Installation Steps:**

1. If Sentinel drivers are required to be installed select **'Yes'** and click **'Next'** to continue.
   If you have been provided with a Software Key select **'No'** and click **'Next'** proceed to installation Step 3

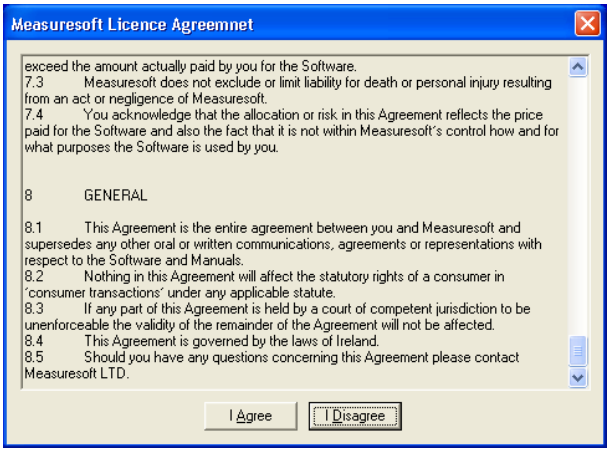

2. A short batch file runs that brings up an empty DOS window, do not interrupt the PC at this point.
   Once the installation of the Sentinel Drivers has completed the window will automatically close.

3. To begin the installation of EdgeX Server click **'Next'** to continue.
4. It is recommended to install EdgeX to the root of the primary drive, in this case **C:\EdgeX**.
   It is possible to install EdgeX to another drive on the machine but EdgeX *must always* be installed to the ROOT of that drive.
   The default installation is to the **C:** drive

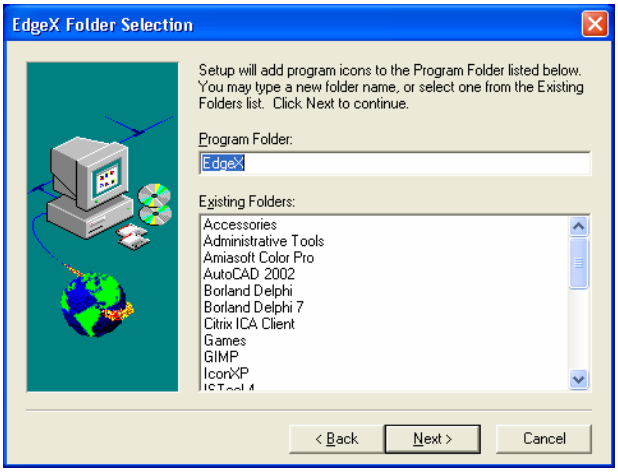



Once you have selected the installation directory click **'Next'** to continue with the installation.

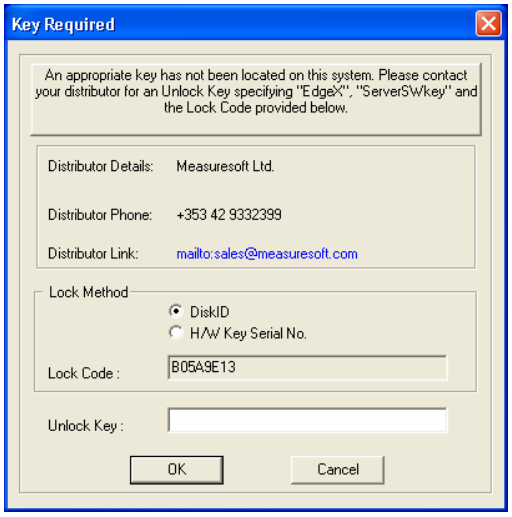
5. You must accept the Measuresoft License. Scroll to the bottom of the text and click **'I Agree'**




6. You can change the Program Group for EdgeX however it is recommended to keep the default setting of **EdgeX**. Click **'Next'** to continue

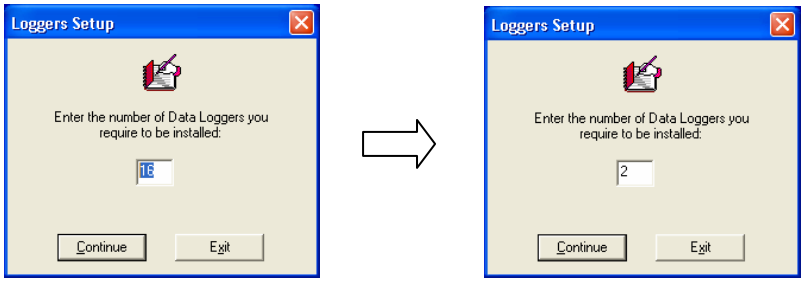


7. If you **are** using a Sentinel then the following screen WILL NOT be displayed, continue to Step 8.



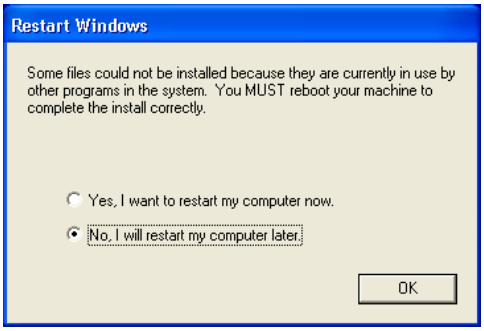

If you **are not** using a Sentinel enter the Software Key that you have been provided to continue.

8. Change the default number of loggers from **'16'** to **'2'** and click **'Continue'**




9. The installation of EdgeX Server will now begin. Should the installation 'freeze' at any point (due to a Microsoft Wizard known bug) move the mouse around to wake the installer.

10. Once the installation completes the following window is displayed:




Select **'No'** to restart your computer now and click **OK'** to continue with the installation.

## END OF EDGEX SERVER INSTALLATION

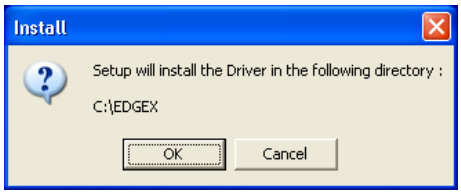
**Modbus Master**

The Modbus Master installer will load automatically once the EdgeX Server installation has been completed.

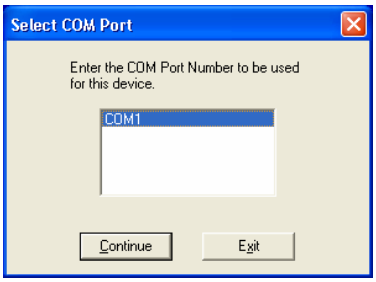
**Modbus Master Installation Steps**

1. At the Modbus Master installation welcome screen click **'Next'**
2. Modbus Master will automatically take on the same installation path as used for EdgeX server. This is a forced path and cannot be changed.

   In this case the default installation path for EdgeX server was selected so the installation path for Modbus Master will also be **C:\EdgeX** click **'OK'** to continue.



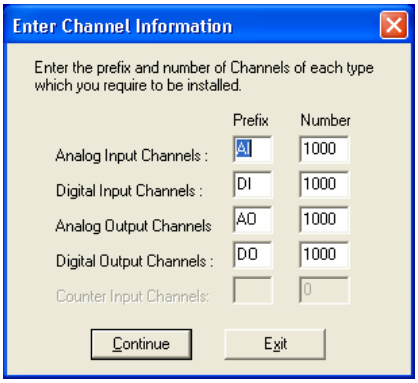

3. You must accept the Measuresoft License. Scroll to the bottom of the text and click **'I Agree'**
4. You can then choose the Program Group for Modbus Master, again it is recommended to accept the default setting which is **EdgeX**. Click **'Next'** to continue.
5. Select COM port from the list of available options and click **'Continue'**




This prompt will change depending on the amount of available COM ports at the time.

Accept any COM port default for now it can be reconfigured later on if required.

6. Accept ***all*** defaults on the **Enter Channel Information** screen. Click **'Continue'**




7. Modbus Master will begin installing and when complete select the option to **'Restart the computer later'** and click **'OK'** to complete the installation

**END OF MODBUS MASTER INSTALLATION**

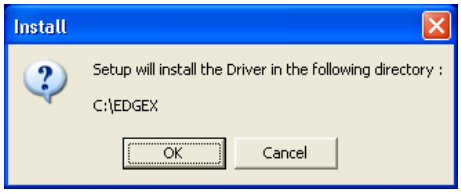
**Modbus Slave Installation**

The Modbus Slave installer will load automatically once the Modbus Master installation has completed.

**Modbus Slave Installation Steps**

1. At the Modbus Slave installation welcome screen click **'Next'**
2. As with Modbus Master, Modbus Slave automatically sets its installation directory to be the same as where EdgeX server was installed. In this case **C:\EdgeX**

   This is forced and cannot be changed.




3. You must accept the Measuresoft License. Scroll to the bottom of the text and click **'I Agree'**
4. You can then choose the Program Group for Modbus Master, again it is recommended to accept the default setting which is **EdgeX**. Click **'Next'** to continue.
5. The Modbus Master installation begins and once complete a Windows Explorer window and a message window are shown:

   Click **'OK'** to end the **Modbus Slave** installation.

## END OF MODBUS SLAVE INSTALLATION

EdgeX Supplementary Installation

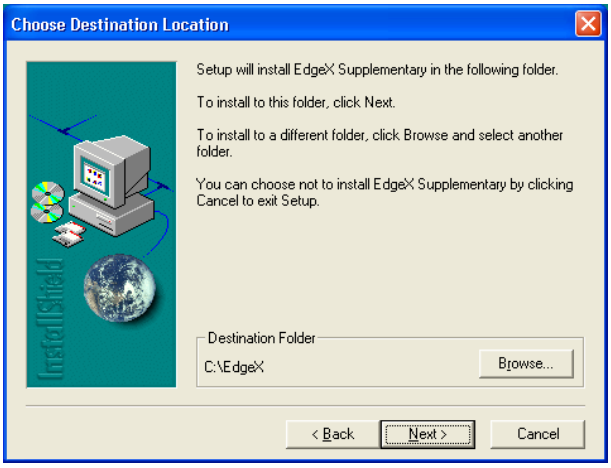
The EdgeX Supplementary installer will load automatically once the Modbus Slave installation has completed.

**EdgeX Supplementary Installation Steps**

1. At the EdgeX Supplementary installation welcome screen click **'Next'**
2. EdgeX Supplementary files ***must*** be installed to the same location as EdgeX Server and both Modbus components. Change the installation path if necessary.

   If the default installation path of **C:\EdgeX** has been maintained there is no need to change the EdgeX Supplementary install path.

   Click **'Next'** to continue




3. The EdgeX Supplementary installation will immediately begin and when complete click **'Finish'** to end the installation.

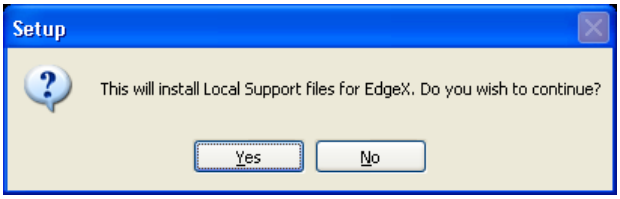
**END OF EDGEX SUPPLEMENTARY INSTALLATION**

**EdgeX Local Support Installation**

The EdgeX Local Support installer will load automatically once the EdgeX Supplementary installation has completed.

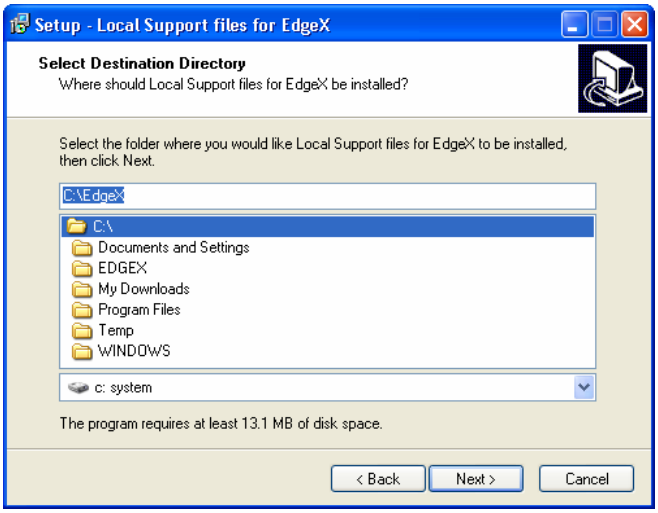
**EdgeX Local Support Installation Steps**

1. The EdgeX Local Support installation will load and when complete will ask if you want to continue with the installation. Click **'Yes'**.



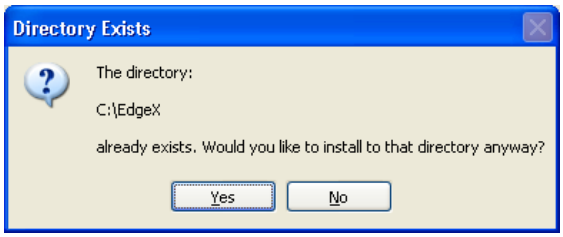

2. At the **Welcome Screen** click **'Next'** to continue with the installation
3. The Local Support files should be installed to the same location as all other previous EdgeX/ Modbus installations (default `C:\EdgeX`)

   Browse to the correct directory (if necessary) then click **'Next'**.



4. A warning is displayed stating that the directory that you have chosen to install to (e.g. `C:\EdgeX`) already exists, would you like to install here anyway?

   Click **'Yes'** to continue.




5. Again it is recommended to keep the default settings for the **Installation Group**. Change this if necessary.
   Click **'Next'**

6. You are now ready to install EdgeX Local Support Files, click **'Install'** to begin.
7. Once the installation has completed click **'Finish'**

**END OF EDGEX LOCAL FILES INSTALLATION**

**EdgeX Updates 2004 Installation**

The EdgeX Updayes 2004 Installation copies across all documentation from the CD to the local machine and performs additional configuration procedures and cleanup of unused itemsl .

The EdgeX Updates installer will load automatically once the EdgeX Local Support installation has been completed.

1. At the EdgeX Updates Installation Welcome Screen click **'Next'** to begin the install.
2. The documentation must be installed to the same location as all other installed EdgeX components.

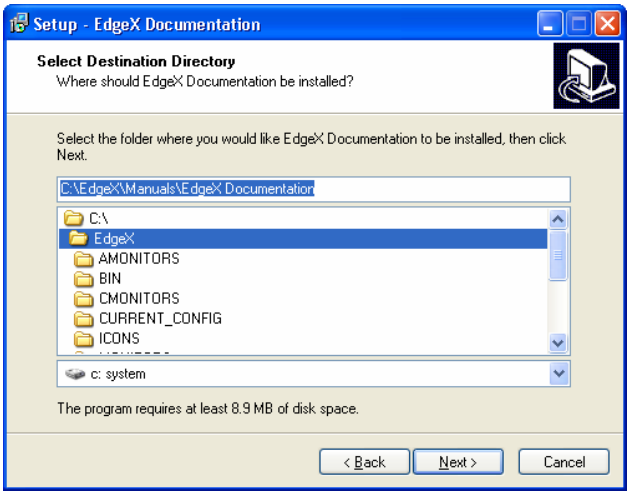
   If these have been installed elsewhere change the installation directory as necessary.

   Again it is recommended to keep the default settings of `C:\EdgeX`

   If differing from default please ensure that the path is:

   `[DRIVE]:\EdgeX\Manuals\EdgeX Documentation`

   Click **'Next'** to continue.

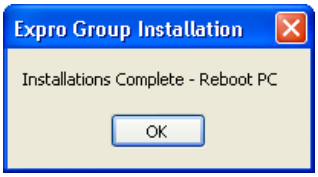



4. Click **'Install'** to begin the installation
5. Once the installation has completed click **'Finish'** to exit the wizard.

**END OF EDGEX Updates 2004 INSTALLATION**

**Installation of EdgeX…Continued**

If you selected to 'Reboot PC' at the beginning of the installation the following prompt should appear:




Click 'OK' to reboot your PC.

**<u>If you did not select 'Reboot PC' please shut down all windows and reboot now as EdgeX requires a reboot before it is first run.</u>**

**Completion of Install**

1. Log on to the PC once it has reloaded
2. Load EdgeX **'Start > Programs > EdgeX > EdgeX'**
3. Load the default **sep1_default.orc** by using **'File > Load'** (This file may be re-named for newer versions)
4. In addition, if not already set.
   Select 'Control' from drop down menu, select 'Autostart' option. This sets up EdgeX to Autos tart from power ups.
   Select 'Loggers' from drop down menu and enable **'Loggers'**
   Change **Loggers** to **'Append mode'**.
5. Save and Exit EdgeX.

**<u>The PC must be rebooted NOW to complete EdgeX Configuration!</u>**

## 9.2 INSTALLATION TROUBLESHOOTING

Should an error occur at any point during the install it is recommended to continue with the installation.

This may occur if this is a re-install without EdgeX being *fully* uninstalled.

Once the wizard completes, restart the computer and navigate to the product installation folder that the error occurred in and enter the **'Disk1'** folder.

e.g. **[DRIVE]:\(Product Folder)\Disk1**

Run '**Setup.exe'**

This will install the individual component. Restart the computer once this has completed.

**Manual Installation Instructions:**

Should it be necessary to install *all* components manually the components should be installed in the following order:

1. [DRIVE]:\Clean-Up\Disk1\Setup.exe
2. [DRIVE]:\Orc Server\Disk1\Setup.exe
3. [DRIVE]:\Modbus Master\Disk1\Setup.exe
4. [DRIVE]:\Modbus Slave\Disk1\Setup.exe
5. [DRIVE]:\Supplementary\Disk1\Setup.exe
6. [DRIVE]:\Support\Disk1\Setup.exe
7. [DRIVE]:\Manual\Setup.exe

Select all default installation paths and folders as with the Installation Wizard.

As with the automated install it is recommended to reboot the computer *after* all components of the system have been installed, it is not necessary to reboot once each component completes.

## 9.3 ADDITIONAL HELPFUL OPERATING SYSTEM TIPS

**EdgeX (Report fonts)**

- Start **EdgeX**, access **Historic Report Start/Stop**
- Generate any text file with headers **'ON'**
- Select **'View'** option.
- Notepad opens up and displays contents of text file.
- By default, Notepad font is set to the proportional font type **'System'** and therefore headers will not line up on the display with the associated data columns.
- To resolve, set font to the fixed type (e.g. Courier New, FixedSys, etc).
- Notepad will retain the revised font choice on future access.

**Client logging add-ons**

When client PC's access the server for files, (e.g. Trend templates and then Log Files), the system assumes by default that these are resident on the network (Server) drive. If the network is remote, then access time can be slow and time consuming. As EdgeX client logging system copies data files to the local drive on the client PC automatically, and template files manually, then it is more convenient for the initial Windows prompt box for file load to default to the local drive first.

Modify the Environment System as follows: -

Access {Control Panel, System, Environment}

| | | |
|---|---|---|
| Variable | = | ***ORC_LOGGED_DATA (Case sensitive)*** |
| Value | = | ***d:\EdgeX\Logged_Data*** |
| Click on Set | | |
| | | |
| Repeat for: - | | |
| Variable | = | ***ORC_TRENDS (Case sensitive)*** |
| Value | = | ***d:\EdgeX\Trends*** |
| Click on Set | | |
| | | |
| Repeat for: - | | |
| Variable | = | ***ORC_CMONITORS (Case sensitive)*** |
| Value | = | ***d:\EdgeX\Cmonitors*** |
| Click on Set | | |

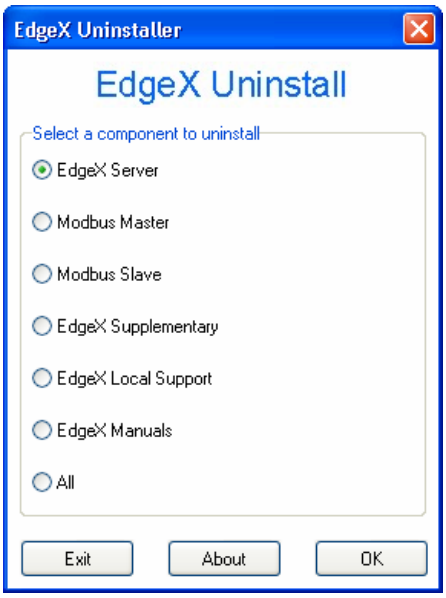
## 9.4 REMOVING/ UNINSTALLING EDGEX COMPONENTS

Should it become necessary to uninstall an EdgeX component or a complete EdgeX system it is recommended to use the **EdgeX Uninstaller** provided on the installation CD.

Insert the EdgeX Installation CD which should autorun bringing up the Main Menu:

Select **'Remove EdgeX Components'** and click **'Start'**

The following screen is displayed:




**Removing a SINGLE Component**

It may become necessary for a single component to be replaced/ updated.

However as EdgeX components interact with each other it is recommended to remove *all* EdgeX components and reinstall from the start to ensure minimum disruption from any problems that may arise.

- Select the component that it is necessary to uninstall and click **'OK'** to begin
- The selected component uninstaller is executed
- It is recommended to reboot the PC between uninstalling and reinstalling an EdgeX component as some EdgeX component files are only removed on restarting the PC

**Uninstalling ALL EdgeX Components**

- To perform a complete uninstall of EdgeX select **'All'** from the menu and click **'OK'**
- The uninstall script for each component is run individually, follow any on screen instructions
- Once all EdgeX components have been removed a message is displayed informing that the PC must be rebooted to complete the EdgeX uninstall
- Ensure that *all* EdgeX Uninstall Wizards have completed running
- Click **'OK'** to reboot

**Once the PC reboots locate the EdgeX installation directory (default C:\EdgeX) and delete this directory.**

**This cannot be deleted until after a reboot as it is a shared folder.**

**Once this folder has been deleted it is now safe to attempt a reinstall of EdgeX.**

**Always ensure that EdgeX Clean-Up is run FIRST on ANY reinstallation of EdgeX!**

## 9.5 SETTING EDGEX ACCESS LEVELS

The standard EdgeX Server installation will set Access Level to **Restricted Server**.

Should a client EdgeX machine be required to be connected to the server the installation procedure for EdgeX is the same as detailed in this document but several components disabled after install.

The **EdgeX Access Level** software provided should be used to perform this.

In order to secure this application and prevent unauthorised access a password is required to perform *any* of the tasks outlined below.

Please ensure that you have the password (provided by Group Engineering) before continuing.

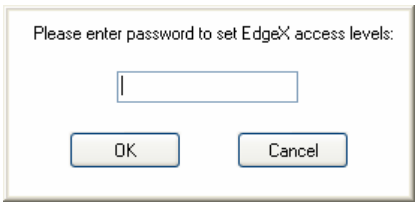
There are three standard levels of access on an EdgeX PC:

1. EdgeX Client
2. EdgeX Restricted Server
3. EdgeX Full Server

To run the EdgeX Access Level software insert the EdgeX Installation CD which will autorun and bring up installation menu.

Select the bottom option **'Set EdgeX access levels'** and click **'Start'**.

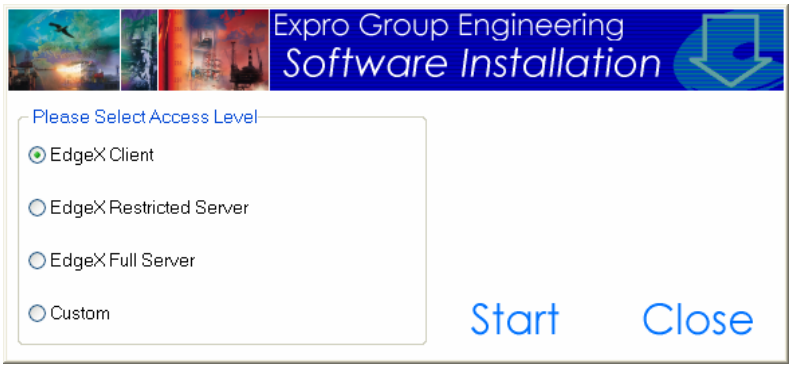
At this stage the application will prompt you for the Access Level password as shown below:




Enter the password and click **'OK'** to continue.

Press **'Cancel'** to return to the previous screen.

The **EdgeX Access Level** screen is displayed




**Setting EdgeX Client Access (minimal)**

**EdgeX Client** access is intended for use when only the reporting features of EdgeX are required (typically on a client PC).

Features left *enabled* are:

- Channel Monitor
- Configurable Monitor
- Export Files
- Trends

1. To set Client Level access select **'EdgeX Client'** from the Menu and click **'Start'**
2. Once the operation has been performed a status message is displayed, click **'OK'** to exit
3. Should any further configuration be required use the **'Custom'** utility (see the **Custom Section** for more information)

**Setting EdgeX Restricted Server**

**Restricted Server** has all the features and components enabled that EdgeX requires to operate. EdgeX Restricted Server is the **RECCOMMENDED** level of access that an EdgeX PC should be given.

Features left *enabled* are:

- Alarm Monitor
- Alarm System
- ASCII Disk Load
- Channel List Config
- Channel Monitor
- Configurable Monitor
- EdgeX
- Export Files
- Export Manual Import File
- Log File Merge
- Log File Synchronization
- Logging Rate
- Manual Input Entry
- New Test Wizard
- Real Time Report Config
- Real Time Report Start/ Stop
- Recalc Status
- Select Server
- Seq. Of Events
- Status Display
- System Error Processor
- Trends

To set Restricted Server access select **'EdgeX Restricted Server** from the Menu and click **'Start'**
Once the operation has been performed a status message is displayed, click **'OK'** to exit
Should any further configuration be required use the **'Custom'** utility (see the **Custom Section** for more information?)

**Setting EdgeX Full Server**

**EdgeX Full Server** should only be set by an experienced EdgeX engineer who requires access to components/ features that are not available on EdgeX Restricted Server.

Once use of Full Server access is complete the PC should be set back to Restricted Server.

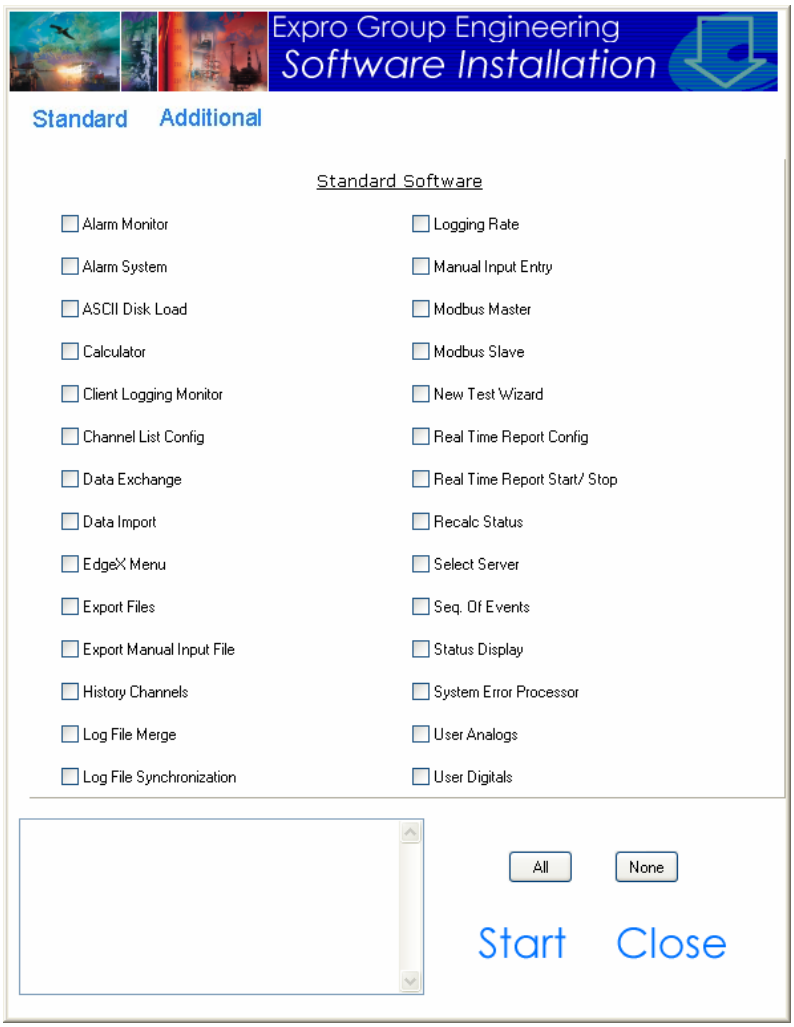
To set Client Level Access select **'EdgeX Full Server** from the Menu and click **'Start'**
Once the operation has been performed a status message is displayed, click **'OK'** to exit
Perform any necessary tasks
Select the original access level and click **'Start'**

**Setting Custom Levels of Access**

Should it be required that an EdgeX PC have access to a component that is not set as one of the default features on the set access level, i.e. Client Level has been set but access to the Alarm System is required then after setting the desired access level the **Custom** featured should be used.

1. Select **'Custom'** from the options list and click **Start'**

   The following screen is displayed:




2. Select the components that you wish to *enable*
3. Click **'Start'**
4. The components are enabled and are now ready to use
5. Click **'Close'** to return to the main menu

To remove components after they have been set repeat the process outlined above but this time select the components that you wish to ***disable.***

**Ensure that once Full Server has been enabled for any administrator work that the original setting is returned once work has been completed!**

**Never give out password for EdgeX Access Level Software!**

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# 10. MISCELLANEOUS

## 10.1 SYSTEM TERMINOLOGY

The following provides a brief explanation of some of the most common system terms.

**Logins**

Terminal prompts user to enter a name and password on power ups, which are referred to as logins. Depending on permissions set, the login name may or may not allow users full administrative control of operating system and EdgeX system.

**Logging Rate**

Rate in seconds that user selects, and determines how much data is saved in the database (Hard Disc). (This defaults to 60 seconds on Start-up).

**Log files**

Data files in the database (referred to as “Logger”), which are named using a date/time convention.

**Logging**

Term used to control log files in EdgeX. This includes:

- Defining which group(s) of channels are saved to the hard disc
- Defining a new log file creation on system start-up or appending to existing one
- Defining a new logger name (New Test)

**Logger(s)**

Term used to create a new database (sub-folder) on the hard disc and is usually created on a test by test basis. Individual loggers maintain their independent log files.

Append or Create mode for Log files

| | |
|---|---|
| **Create** Log file. | A new log file is created within the logger folder on all instances of system or loggers start-up. |
| **Append** Log file | Data is continually appended (added) to end of existing log file on all instances of system or loggers start-up. |

N.B. Although recommended during a specific test, users should be aware that one very large log file could eventually be unmanageable.

**Re-Calculation**

Term used when re-generating the database log files, i.e. if calculation channels (RH classification) have been saved to disc, which are dependent on any MI channel, then re-calculation will modify/update the database channels within the log files.

**Disable/Enable**

This is term used within system to start or stop various processes.

See alternative instruction for further information.

**Flow rates (Instantaneous)**

Flow rates, etc are computed over one second

**Flow rates (Averaged)**

Flow rates, etc are averaged with readings computed over a set time period as defined by user. System starts up with 5 mins as default.

E.g. If log rate = 1 minute and averaged period set = 15 minutes, then reading at 15 minute intervals is average of previous 15 readings.

**Flow rates (Smoothed)**

Flow rates, etc are smoothed with readings computed from each previous reading. This technique uses an interpolation algorithm to compute a best fit from data points.

## 10.2 CHANNEL IDENTIFIERS

All channels have 8 character tags and associated descriptions. RH channels are primarily output channels for flow rates etc and the following summarizes typical identifiers within the tags.

| | | |
|---|---|---|
| Q | = | Flow rate |
| Sep | = | Separator Conditions |
| Stk | = | Stock Tank Conditions |
| | | (Also referred to as Standard Conditions) |
| I | = | Instantaneous Flow rate |
| S | = | Smoothed Flow rate |
| Av | = | Averaged Flow rate |
| O | = | Oil |
| g | = | Gas |
| w or $H_2O$ | = | Water |

E.g. RH138 = Qostk1av

(Averaged stock tank oil rate for stage one)

# 11. TROUBLESHOOTING

## 11.1 SWITCH SETTINGS (DATASCAN)

**7010** Switches 1 and 3 on

Switches 2, 4, 5,6,7,8 off

Switch no. 3 is for mains frequency

Off = 50 Hz

On = 60 Hz

Most rigs are 60 Hz

**7041** Switch no. 7 on

Switches 1,2,3,4,5,6,8 off

Switch 7 sets channel address to DS17 - DS32

**7020** All switches off

New systems replace 7010/7020 combination with a single 7220 analogue Datascan.

**7220** Switch 1 ON ONLY. - Defaults for channel address DS1-DS16.

Datascans can be multipled up with any combinations via their RS485 connectors.

New style EDGE interfaces have 3 pole connectors pre-wired for this purpose on their back plane. These units also utilise the 7220 type Datascans.

To multiple up 3 x 16 analogues plus 2 * 16 pulse Datascans, the following example provides a typical configuration.

| DS Channels | Interface 1 (Sw) | Interface 2 (Sw) | Interface 3 (Sw) |
|---|---|---|---|
| 1 - 16 | 7220 (1 ON) | | |
| 17 - 32 | 7041 (7 ON) | | |
| 33 - 48 | | 7220 (1 & 6 ON) | |
| 49 - 64 | | 7041 (6 & 7 ON) | |
| 65 - 80 | | | 7220 (1 & 5 ON) |

Refer to the DATASCAN 7000 type manuals for alternative switch settings for other combinations.

## 11.2 ERROR CODES

### 11.2.1 Gas

| Gas Calculations | | |
|---|---|---|
| **Error No.** | **Description / *Problem*** | **Limits** |
| 1 | Beta Ratio<br>*Check orifice and line diameter.* | 0.1 < β < 0.75 [ Flange Taps ]<br>0.2 < β < 0.67 [ Pipe Taps ] |
| 2 | Orifice Diameter<br>*Check orifice*<br>*( d < 0.45" errors of up to 3% can occur)* | d > 0.45" |
| 3 | Pipe Diameter<br>Check pipe diameter | D > 2" |
| 4 | Expansion Factor<br>Check pipe diameter | 0 < x < 0.2 |
| 5 | Gas Content<br>Check H2s and Co2 for Fpv | 0 < H2s + Co2 < 0.8 |
| 6 | Reduced Temperature<br>Check Fpv inputs | 1.05 <= Tr <= 3.0 |
| 7 | Reduced Pressure<br>Check Fpv inputs | 0 <= Pr <= 30 |
| 8 | Super compressibility (No convergence)<br>Check Fpv inputs | |
| 9 | Tap Type & Position<br>Check tap & position inputs | |
| Comments: | | |

### 11.2.2 Oil

| Oil Calculations | | |
|---|---|---|
| **Error No.** | Description / Problem | **Limits** |
| 1 | Shrinkage Type - Check shrinkage type. | |
| 2 | SG - Check Oil SG | |
| 3 | SG temp - Check Oil SG temp. | |
| 4 | Shrinkage (No convergence))<br>Check shrinkage inputs | |
| 5 | VCF (No convergence)<br>Check VCF inputs. | |
| Comments: | | |

### 11.2.3 PC Inputs (ASCII Interface)

| PC Inputs (ASCII Interface) | | |
|---|---|---|
| **Error No.** | Description / Problem | **Limits** |
| 001 | No terminator found.<br>Has not received CR and LF characters to complete receive sequence. | |
| 002 | Message too long.<br>Date, time, channel data, etc > 256 characters. | |
| 003 | Date or time formats in error.<br>Usually due to time not lagging EDGE time. | |
| 004 | Values or numbers in error<br>Channel data is not simple ASCII characters. | |
| Comments: | | |

### 11.2.4 SRO

| SRO Calculations | | |
|---|---|---|
| **Error No.** | **Description / *Problem*** | **Limits** |
| 21 | Unable to initialise device error?<br>The controller box has sent no results to the PC in the last 30 seconds. | |
| 22 | Unable to initialise device error?<br>The response received from the controller box contains no termination character (i.e. carriage return, ASCII code 13). | |
| 23 | Unable to initialise device error?<br>The message received from the controller box is too long for the PC (in excess of 100 characters). | |
| 24 | Unable to initialise device error?<br>Not used. | |
| 25 | Unable to initialise device error?<br>No controller box configuration file exists on the PC. To cure this, use the device configuration menu to specify the configuration. | |
| 26 | Unable to initialise device error?<br>No gauge confirmation file exists on PC. To cure this, ensure that configuration files for all the gauges connected to the controller box exist on PC | |
| 27 | Unable to initialise device error?<br>No prompt character (>) was received from the controller box at the first stage of initialisation. | |
| 28 | Unable to initialise device error?<br>No controller box program exists on the PC. To cure this, ensure that the program is copied to PC. | |

### 11.2.5 Additional Troubleshooting

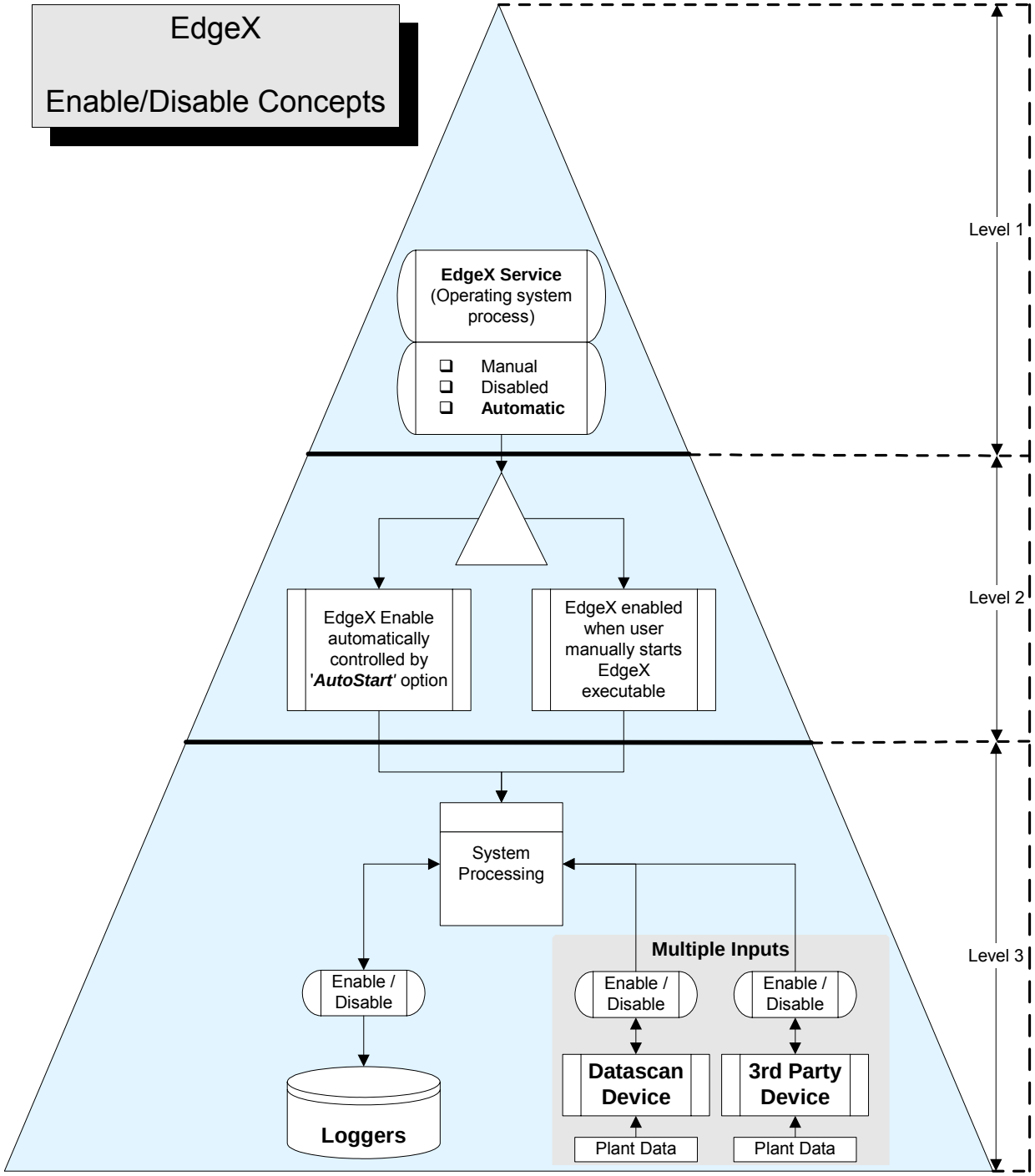
| Application Problems | | | | |
|---|---|---|---|---|
| | | | | |
| **Application** | **Error** | **Cause** | | **Solution** |
| **Windows** | Application 'freezes' up | Many possible causes | 1 | Right click on lower task bar to select/activate Task Manager or hit **'Ctrl + Alt + Del' and select** Task Manager |
| | | | 2 | Select problem application/task. |
| | | | 3 | Select **'End'** option. |
| | | | | |
| | | If PC still doesn't respond then power down for hard reboot sequence. | | |
| | System reports problem with services | | 1 | Select '**Start > Control Panel > Administrative Tools > Services**.' |
| | | | 2 | View list and open required option in attempt to determine problem. |
| | | | 3 | **NB** Windows by default may have several unavoidable events which should not cause problems. |
| | | | 4 | Serious items will normally require base maintenance attention. |
| **EdgeX Server** | EdgeX system exhibiting anomalies after creating new logger. | PC requires reboot after adding new logger | 1 | Save all open files including EdgeX .orc file |
| | | | 2 | Reboot the PC |
| | Unable to control log rate | Individual devices e.g. GSC can be controlled independently. However, they require to be logged to secondary logger(s) for any meaningful effect over and above main top level logger | 1 | System must be active to top level logger |
| | Unable to log data | | 1 | Check free disk space. |
| | | | 2 | Check logger is enabled. |
| | Unable to reproduce data channels historically | Channels may not be getting logged | 1 | Ensure channels are logged to disk |
| | Previous Log File still shown in **'Open State'** | User creates new Logfile, but notes in file open box prompts, Explorer, etc. that previous file still shown in open state. | 1 | Shutdown old trend application which has locked onto previous file |

| | | | | |
|---|---|---|---|---|
| | Wrong manual input available to user | | 1 | Top level logger is changed which automatically selects its associated MI file. |
| | | | 2 | Top level logger can be changed by: |
| | | | | Editing logger name |
| | | | | Loading .ORC (Orchestrator configuration) file. |
| **Transducers** | All or most readings become erroneous | Possible Fluid ingress into system (i.e. Transducer, connector, joint box) | 1 | All main interface connectors must be isolated and re-connected separately to isolate multi cable group problem |
| **Configurable Monitor** | Error - Unable to launch C:\EdgeX\BIN\MI.exe | Configurable Monitor looking for executable in default location. | 1 | Cancel error |
| | | | 2 | Go to **Monitor** and select **Configure Monitor** |
| | | | 3 | Double click **Manual Inputs** |
| | | | 4 | Change the executable path and click **OK** |
| | | | 5 | Change monitor back to **Value Entry Mode** |
| **Loggers** | Loggers stop logging when screensaver becomes active | PC power settings are turning computer onto **Stand By** mode | 1 | Go to the **Display Properties** |
| | | | 2 | Click the **Screen Saver** tab and then **Power** button |
| | | | 3 | Ensure all settings are set to **Never** |
| | | | 4 | Apply changes |
| | Target Application Not Found | Applications installed to wrong directory | 1 | Ensure *all* EdgeX components are installed to the same folder |
| | | | 2 | Default folder is C:\EdgeX |
| **EdgeX Supplementary** | On install receive error 997 | DLL not released by another installation | 1 | Select **OK** to cancel installation |
| | | | 2 | Proceed with remaining installations |
| | | | 3 | Once remaining installations complete select *only* EdgeX Supplementary to install |
| | | | 4 | Click **Start** |

| | | | | |
|---|---|---|---|---|
| | | | 5 | Reboot PC when complete |
| **Real Time Monitor** | On execution receive ScadaPro.dll error 'Access Violation at address 100011E1…' | Channels being looked at in Alarm System file do not exist on the current configuration | 1 | Locate EdgeX directory and go to **RT Monitor\Alarms** |
| | | | 2 | Delete **Alarms.** |
| | | | 3 | Re-run RT Monitor.exe to rescan for channels |
| | | | 4 | If error re-occurs then a channel is being monitored on a screen that does not exist in the system. Remove reference and repeat the above procedure |

## 11.3 SCHEMATICS

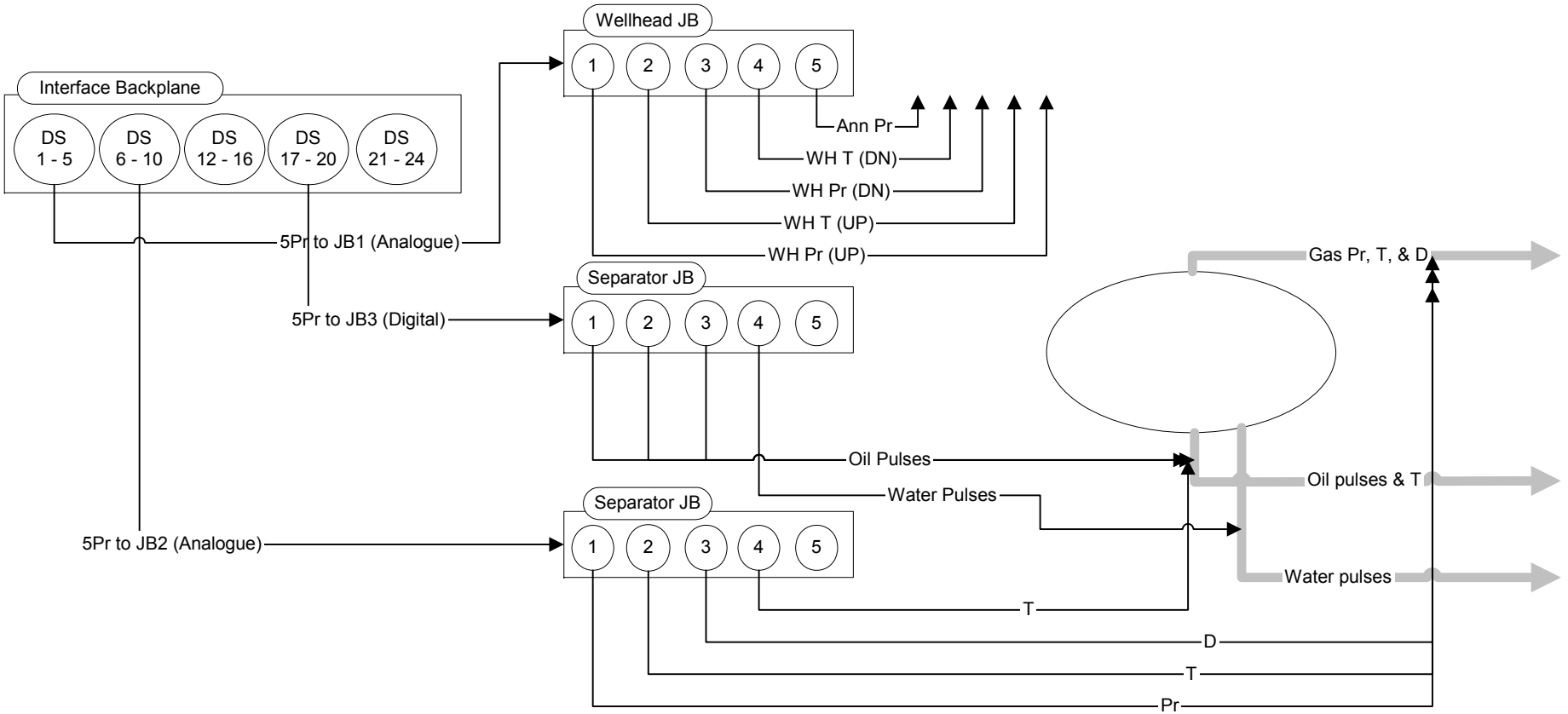
### 11.3.1 Enable/Disable Concepts



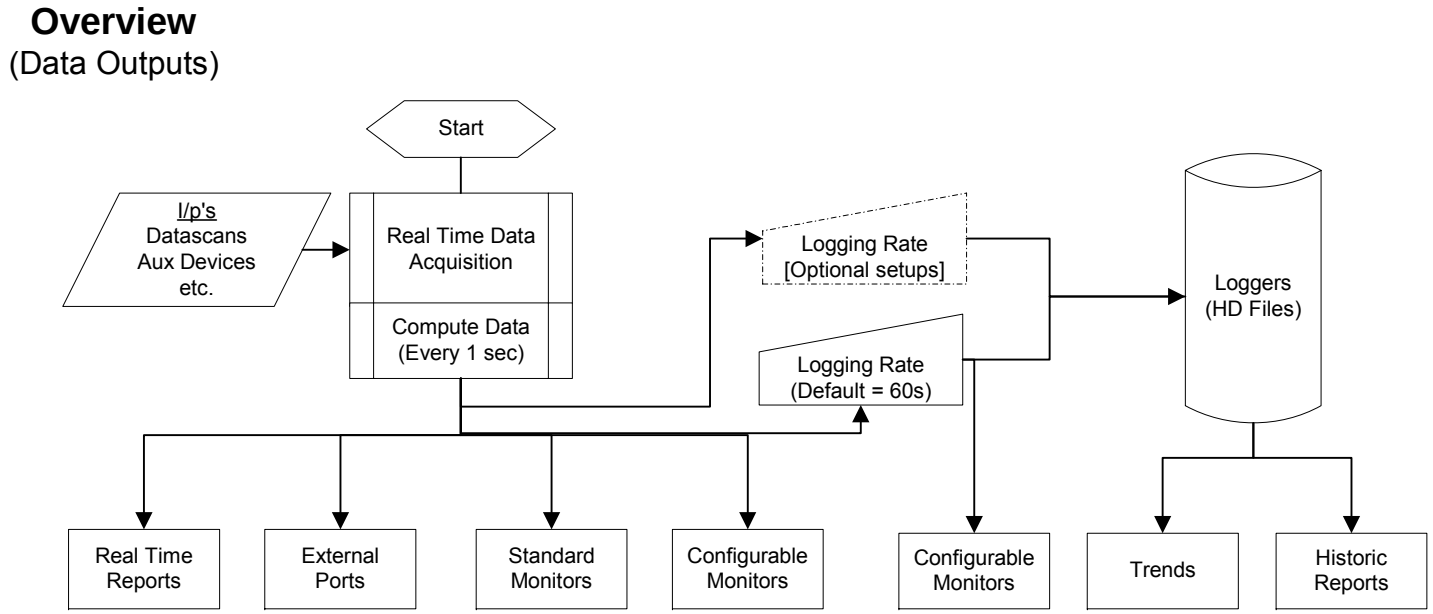

Comments

1. Enable/Disable are EdgeX terms for start/stop functions.
2. Level 1 is highest priority. 'Automatic' option ensures that EdgeX can start up from power down without any user assistance, assuming level 2 'AutoStart' option is switched on.
3. Level 2 enable determines how many devices to enable in level 3 assuming their local 'Autostart' options are switched on.

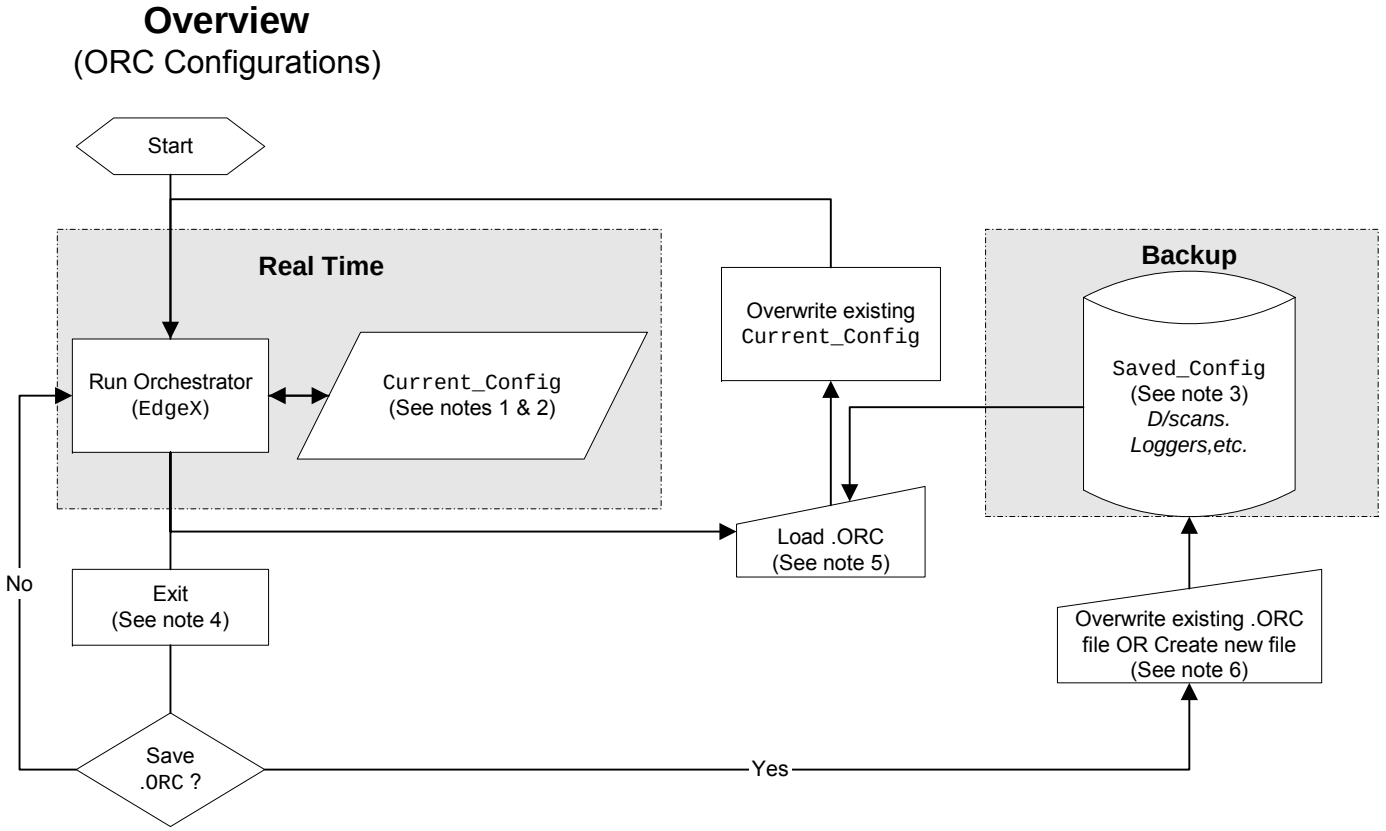
### 11.3.2 Schematic – Typical Interface Hook-up



### 11.3.3 Schematic – EdgeX Overview



### 11.3.4 Orc File Overview




Notes
(1) 'Current_Config' is folder under 'EdgeX' where all real time configurations are controlled & run.
(2) Specific configuration (eg. Loggers) can be locally modified and uniquely saved.
(3) .ORC file is complete [compressed] copy of a Current_Config folder & all its sub-folders.
Backup copy is maintained under Saved_Config
(4) Re-starting EdgeX from bootup will remember local changes within 'Current_Config'
even though master backup is NOT updated in 'Saved_Config'
(5) Loading a .ORC backup will **overwrite all** existing configurations.
(New configurations may require device driver initialisation, therefore system reboot strongly recommended.
(6) The default .ORC file provided with system should not be modified. End users should save a separate file unique to local operations.